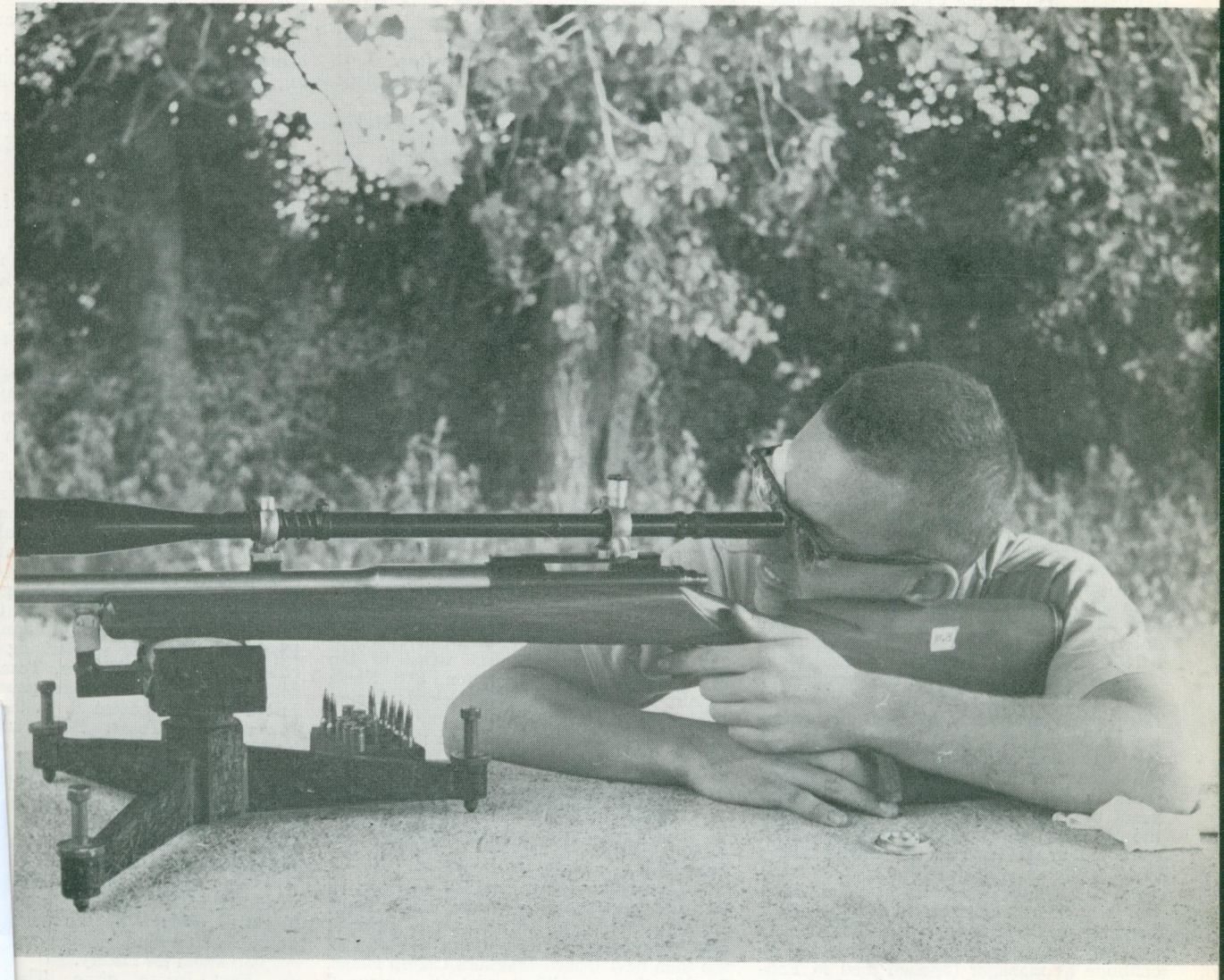
DECEMBER 1964
Vol. 9, No. 7
40 cents

Precision SHOOTING



a magazine for Shooters by Shooters

Precision SHOOTING

PUBLISHED MONTHLY BY PRECISION SHOOTING, INC.

Editorial and business office at
Lyndonville, Vermont 05851.

Editor—P. H. Teachout
President—Creighton Audette
Vice-President—Dermot Reilly
Treasurer—P. H. Teachout
Clerk—Frederick G. Mehlman

Subscription rates:—To the U. S., Canada and Mexico, 1 year $4.50, 2 years $8.00. All other countries $1.00 per year additional. Change of address requires 30 days' notice.

Place of Publication—Cowles Press, Inc., St. Johnsbury, Vt. Second-class postage paid at St. Johnsbury, Vt.

COVER PHOTO

Shows Robert A. Freund, St. Louis, Missouri, with the rifle which he used to shoot a Light Varmint class National record small group of .1735 inch for 5 shots at 100 yards, fired on the Col. Whelen range at St. Louis on May 16, 1964.

Robert has been shooting competitively since 1960, except for the 1963 season when he was laid up due to a serious eye injury suffered in a Fourth of July celebration accident.

The rifle is a 6mm International on a 722 Remington action, stocked by his father, A. J. Freund. The barrel was made and installed by the Nu-Line Gun Shop of St. Louis. The scope used for setting the record was a 10X Weaver—not the scope shown in the photo. The load used in setting the record was 31.5 grs. of 3031, 73 gr. Freund bullet and RWS primer.

Our hats are off to Bob for such an achievement and such a swell comeback after his injury.

Al Walter

AMERICAN SMALLBORE RECORD GALLERY POSTAL MATCHES

For 1964-1965

The American Smallbore Records Gallery Postal Match was founded in 1918 by Cris Westergaard of Iowa to serve as a gallery competition for the Schutzen type of offhand shooting. From the beginning until last year (1963-64) the match has been an individual 100 shot offhand event for .22 cal. rimfire rifles, fired on a reduced gallery version of the 25 count RING target of the Schutzen riflemen. There were no limitations on equipment other than that only .22 cal. rimfire cartridges were permitted, and that the shooting be done from the offhand position. It may have been fired at 25 yards range in the beginning but for many years it has been fired at 50 feet range. For many years the match was open to "anyone in the World" but in recent years has been restricted to residents of the United States and Canada.

For a good many years past the match was very efficiently managed by Spencer J. Lanning of Sioux City, Iowa, but due to age and failing health he was unable to continue as manager (Spence died in February 1964) and at his request Charles E. Lyman 3rd, President of the Blue Trail Range Corporation, took over management of the match for the 1963-64 season.

Some changes were made for the 1963-64 match. The traditional KING match of Schutzen days (a 10 shot match) was dropped. Partly because the printing plates for the Ring target were worn to near uselessness and partly (probably) because of the number of possible 250 per target scores fired in recent years, a new target was adopted and the choice was the ISU metric target reduced for 50 feet range (NRA No. A-36). With the idea of broadening the competitor base, categories for Collegiate and Military shooters were added, but only three competitors entered in each of these categories.

However, Gary L. Anderson, now Olympic and World's Champ, and World Record holder for the 300 meter ISU course, was collegiate winner and overall runner-up with a 935X1000 score for the 100 shots. Richard Betz, Exeter, N. H., one of New England's top gallery riflemen, was the match winner with a 938 score. Robert White, New Boston, Mich. was 3rd with 929, and R. Barry Trew, Bentleyville, Pa. was 4th with 924. Fifth and high Military was Sgt. Roy Sweei, Vt. National Guard, Windsor, Vt., with 919. August Westergaard, Sloan, Iowa, was 6th with 916. There were 152 who returned fired targets and there were 27 others who entered but did not return targets. The lowest score reported was 336.

The coming 47th Annual Match (December 1964 through March 1965) has had the competitor base further broadened, but with the Military category discontinued. The Senior Match retains the traditional course of fire of 100 shots offhand with ANY .22 cal. rimfire rifle and ANY sights at 50 feet. Top prizes of beautiful Blackington awards to top five places and equal prizes to each fifth place thereafter. Last 5th place award last year to 150th place was won with a score of 424.

A Collegiate Match has been retained but this year the course of fire is 50 shots offhand and only METALLIC sights are permitted—otherwise equipment is the same as for the Senior Match.

Additional categories are a Junior Match for competitors under 19 years of age, firing 20 shots prone and 20 shots standing, equipment same as for Collegiate, AND a Sub-Junior Match for competitors under 14 years of age, firing 50 shots prone, using metallic sights and set triggers and hook buttplates ARE NOT permitted.

Provision is made for both individual and five-man team entries in all four categories. One set of targets fired in the team matches will be ranked for the individual match at no additional entry fee.

In the past it was not necessary to fire all targets of a match at one shooting session. One or more targets could be fired at any time a shooter felt capable of doing his/her best, providing the witness was present and that all fired targets be returned before the closing date of midnight March 31st. Since no mention is made of any change, we presume this system is still effective. But write to the Blue Trail Range Corporation, 316 North Branford Road, East Wallingford, Conn., right away for a match program, and then take a try at the match—it is a good one.

P. H. T.

Bull-Session Stuff

REPORT ON SCOPE CLAMP

Dear Phil:

Seems like I owe you an apology. I was just going through some of my back correspondence and came across a letter from you regarding me trying out one of the then new Unertl Magnum Clamp Rings. So, like they say, "Better late than never."

After installing one of the Unertl Magnum clamp rings on a Unertl 2″ scope, the first thing that came into my mind was, "Why didn't someone think of this a long time ago?" This seemingly unimportant little piece of equipment has been a headache for years and the majority of shooters simply tolerated it as there just wasn't anything available to take its place. A good many of the bench rest shooters have in past years made their own stop rings, and a multitude of different types can be seen at any bench rest match. Many of the "home made" clamp rings also incorporated a gimmick to return the scope "rotationally" to the same point each time. In my opinion the clamp rings which incorporated the rotational "return to zero" were somewhat of a flop as I know of quite a few fellows, including myself, who had one of these gimmicks go hay-wire in the middle of a match with the result being that you ended up on the bottom of the aggregate list.

This new clamp ring as put out by Unertl is "the nuts." I put the Magnum clamp ring on the 2″ scope, following the factory instructions which are included with the clamp, and then installed the scope on a 300 Winchester Magnum Bull gun. After 40 shots from a bench rest, I can only say that the clamp ring came out of the test a lot better than I did. I had the return spring set up so tight that it returned the scope with a "slam," and the magnum clamp held, didn't move even a fraction of an inch through the 40 shots. As for me, I ended up with a cut on my nose (scope hit me once) and a dull headache that lasted me the rest of the day.

I would like to point out that these Magnum rings will fit scopes other than Unertl (sizes to fit ¾, ⅞ and 1 inch scope tubes), and they can be installed without having to take the scope apart. Unertl even supplies an allen wrench with each clamp (you need the wrench when changing the ring position on the scope tube).

Ed Shilen
Clinton Corners, N. Y.

EXPERIENCES, A GRIPE AND A QUESTION

Dear Mr. Teachout:

In the October '64 issue of "Precision Shooting" you asked for material written by readers. You may find that you regret this request, but it motivated me to this attempt. Actually this will cover a considerably broader scope than you had in mind, but since this is my first such try I would like to make a few observations in general.

In order that you and your readers may better evaluate these following observations, some of which are gripes, a short history of the writer's gun experience and background is in order. I am a graduate engineer which keeps me moving quite often, but as a youngster most of my leisure time was spent hunting with my father; normal stuff—rifle, pistol and shotgun for pheasant, partridge, rabbit, squirrel, deer, and target practice.

In 1956 I gave up photography as a hobby in order to take up gun tinkering in the form of handloading, varmint (Prairie Dog) shooting, and sporterizing of military rifles. I lived in Electra, Texas, just one block from two very fine gunsmiths, and just a few miles from R. B. Sisk's shop in Iowa Park, Texas. Both smiths were benchresters, and I spent considerable time watching them work and shooting with them. In 1960 I moved to Central Kentucky where I teamed up with my brother (an excellent machinist) in the building of our first benchrest rifle. I'll not go into the details, but it grouped at less than ½ inch at 100 yards for 20 shots when new. In 1962 I finally moved to Michigan, where, by the way, there is no active NBRSA club.

So much for history.

First for a girpe. The President's Corner, Oct. '64, makes quite a fuss about a lack of returned questionnaires. I realize that I am green and that I have never attended an NBRSA match. I would like to return this questionnaire filled out. However:

1) What **is** the "BEST FIVE" proposal?

2) What is the difference between a Hunter class and a Sporter class rifle?

3) What **is** a correctly run registered match?

GALLERY POSTAL MATCHES

49th. AMERICAN SMALLBORE RECORD MATCH

now for

SENIORS — COLLEGIATES — TEENAGERS — CHILDREN

CLUBS — COLLEGES — HIGH SCHOOLS — JUNIOR CLUBS

Individual and 4 man team—one score for both

SENIOR MATCH — 100 shots offhand

COLLEGE MATCH — 50 shots offhand

JUNIOR MATCH — 20 shots each prone—offhand

SUB JR. MATCH (under 14) — 50 shots prone

To be shot between December and April — A-36 targets furnished

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Compare your ability with the Nation's best
You don't need to be on top to win an award
Send for entry blanks

THE BLUE TRAIL RANGE CORP.

316 N. Branford Rd., E. Wallingford, Conn.

4) What **are** the present Regional Division boundary limits?

In short, how about letting the newer and less informed members in on the present rules, methods, regulations, and practices of the NBRSA rather than assuming that we are all old timers? My pappy always said to be constructive! Therefore, how about mimeographing papers covering the above for each new member? Also for each member when enough changes have been made to warrant same?

So much for the gripes.

I've experienced barrel trouble. When I left Kentucky, where I got to do quite a bit of shooting, my 224 Super was keeping 20 shots under ½" at 100. Nearly a year and a half passed in Michigan before I had the opportunity to drag the 224 Super out to a suitable range. Ten shots had a vertical dispersion of 0.27", but horizontal dispersion ran 3". Shooting conditions average to good. I tried all the tricks of loading and bedding which came to mind with no change in grouping. Having so done, it appeared to be a faulty scope problem, Balver 6-24X. I sent this in to the B&L people and they went through it, and returned it with no charge. A friend had just purchased a 22/250 benchrester which lacked a scope. To test both, we used mine. Result, 0.7" or less groups. Scope went back on my rifle. Same ¼ X 3" groups. Last resort, check barrel. I cleaned the barrel until 200 patches came through as clean as new. J-B compound was used in the early stages of cleaning. Inspection revealed what appeared to be "chatter marks" in a series for about the last 5 inches of the barrel. This is a Douglas Premium barrel.

Now if they ("chatter marks") were always there, how come the early good groups? If this is the problem, why just the horizontal displacement? In short, I've found something which doesn't appear to be correct, but is this the true cause?

The rifle is a 24 pounder, FN bench action, full heavy barrel—never turned, with Fajen bench stock, Balvar 6-24X scope—mounts are tight, and glass bedded action with free floating barrel.

The 224 Super is made by Claude Sublet, Rod & Gun Shop, Campbellsville, Kentucky. This is a standard 243 Win. case necked down to .224 bullet. The chambering job is the kind you dream about having. I inside taper my case necks, and hand seat the bullets.

On this last, I have heard a few arguments that this allows for gas to blow by the bullet and erode the barrel throat. However, I can see this happening even more quickly in a "free bored" barrel. My barrel throat, at present, is the best looking part of the barrel. Any comments?

If any one has any ideas or similar experiences with the type of problem outlined, I would certainly like to hear from them.

While I'm at it, I would like a list of the gentlemen, with addresses, who support "Arms Control & Disarmament, State Department Bulletin #7277, and Freedom From War—The U. S. Program for General and Complete Disarmament in a Peaceful World." I believe that letters written to these people, should they remain in office, by individuals will be valuable to our cause.

Finally a few observations about "Precision Shooting" from a new member. This is a fine publication! "Stool Shootin Stuff," articles on "How To," "How it was Done," and just plain chit chat on the theoretical aspects of loading, working over cases, bullet making, die forming, bullet design, etc. could be increased in my opinion. I'd like to see more pictures of what the other fellow is shooting, and maybe a few close ups of actions for comparison. Something like an FN bench action, a Schultz & Larsen bench action, and a Shilen Bench action all on one page.

Thanks for your time.

Richard D. Stauffer
4157 Singel Drive
Grandville, Michigan 49418

(P. S. Editor's comment: The NBRSA Rule Book, available from the NBRSA Secretary at, I believe, a cost of 50¢, supplies essential information on permitted equipment, classes of competition and equipment specifications, administration and conduct of registered competitions, and other information pertaining to benchrest competitions. Making available printed copies of the NBRSA By-Laws, including the areas covered by the various Regions, at a nominal cost to cover printing and mailing, would be most desirable for both new and old members, and even to provide convenient reference for Directors and Officers.

Information, experiences, photos, problem queries like the foregoing, and discussions, from and by readers, pertaining to ALL TYPES of rifle and handgun shooting, are very much desired. We want P. S. to be a forum for you readers and all shooting people. We DO NOT want it to be dominated by any one or small group of people. But we can't have what we want without the cooperation of a lot of you people.)

HOW MANY?

Dear Mr. Friedrich:

I was greatly interested in your letter in Precision Shooting. November issue, to learn that you are still shooting at 81 years of age. I thought I was the only one. It would be interesting to learn how many there are who are still good enough to get on the firing line with the rest of the boys

(Continued on Page Seventeen)

BENCHREST RIFLE RESTS

By Phil Teachout

To people who have never had the opportunity to observe modern benchrest competitions, it is probable that many terms used in reporting matches and in discussions of benchrest shooting convey little understandable information. Terms used for indicating classes of rifles and resting systems are probably one such area of confusion for the casual but interested reader. Even some benchresters get confused with some of the terms used. Perhaps some notes and illustrations on rifle resting systems will help to better understanding.

The National Bench Rest Shooters Ass'n "Unrestricted Rifle" class is exactly what its title implies—there are no restrictions on caliber, weight, dimension or design of the rifle. However, the class does have two sub-divisions, based on the resting systems used for competition.

The Unresrticted Rifle "Open" class permits the use of both front and rear rests which guide the rifle in recoil and permit it to be pushed back to a consistently uniform point of aim for successive shots. Both or one (usually the rear) of the rests may have mechanical means for precise adjustments, both vertically and horizontally. The only restriction for the "Open" class rests are that the two rests must be two separate units, not joined to each other by any means and must not be fastened to the rifle or to the bench. The Open class rests are frequently called "mechanical rests," "precision rests," "back to battery rests," and even by some as "machine rests." There are many types and variations of these Open class rests—they being individual creations made to suit the ideas of the shooter.

With the Open class rests, once the rifle is precisely sighted in on the target, entire 10-shot matches may be, and frequently are, fired without again looking through the sights. The competitor may pay all his attention to watching wind conditions and try to fire the rifle when conditions are the same. Shots may be fired very rapidly during short intervals when wind conditions are uniform and the same as when the rifle was sighted on the target. In very rapidly changing wind conditions, this type of resting loses much of its effectiveness (at least in the opinion of many shooters). The Open class resting system is at its best under conditions of very heavy mirage in calm to light uniform wind. The guiding means for many Open class rests are relatively simple and effective, but some of the rests have quite complicated guiding means and adjustments.

The Unrestricted Rifle "Limited" class is only different from the "Open" class in that only a sand bag or equivalent may be used for resting the buttstock on. The sand bag rear rest **may not** have any permanently formed grooves or other means for guiding the buttstock in the rifle's recoil, and the sandbag **may not** be contained in any device permitting mechanical adjustments. The shooter must aim each shot in Limited class competition.

At some benchrest tournaments which program separate matches for each Open and Limited classes, the same rifle may be, and sometimes is, used to fire in both classes, simply by substituting a sand bag for the mechanically adjustable rear rest to fire in the Limited class.

In the early days of benchrest competitions the forearm of the rifles was usually rested on a moderately tight-packed sandbag or other "soft" rest placed on the tray of the front pedestal or blocks of wood. At present day competitions, a rifle forearm rested on a sand bag or other soft rest is seldom if ever seen. The present day forearms "hard" rests are of metal, plastic or other firm material. The forearms of present day Unrestricted class rifles nearly all have wide, flat bottoms. The bottom of the buttstock of many rifles is also, flat, wide, and the bottom surface parallel with the bottom of the forearm bearing surface.

The wide, flat forearm bottoms and horizontally flat, hard rests provide uniform positioning of the rifle on the rests and retard the "torque" rolling of the rifle in recoil. The "hard" forearm rests also provide a minimum of frictional drag on the rifle in recoil. In Limited class, the rear sandbag rest is usually kept liberally sprinkled with talc powder to reduce the frictional drag on the rifle in recoil.

Very nearly all Unrestricted Rifle, Limited class shooters permit the rifle to freely recoil for an inch or more before firmly contacting the shoulder. (With the increase of .30 cal. shooting, I had wondered if those shooters used the same techniques they had with the lighter recoiling .22's. Observation at the Johnstown, N. Y. shoot in September indicated that at least most of the .30 cal. shooters do permit the short, free recoil of the rifle before the butt-plate does meet the firm contact with the shoulder.)

The lighter rifles used in the Varmint and Sporter classes quite generally have flat bottomed forearms and are shot off "hard" front rests. However, the stocks of these lighter rifles are limited to a maximum 3 inch width, and most of them have well proportioned stocks, neat in appearance and with quite conventional buttstocks.

The photos illustrate some typical rests in use at competitions during the 1964 shooting season. Photos number 1 through 8 were made by Victor Fogle, Springfield, Oregon, at a Yreka, California shoot.

Photos number 1 and 2 illustrate typical hard front rests. Rifle in number 2 seems one that could be used in both Open and Limited class. As shown, it would be Limited class.

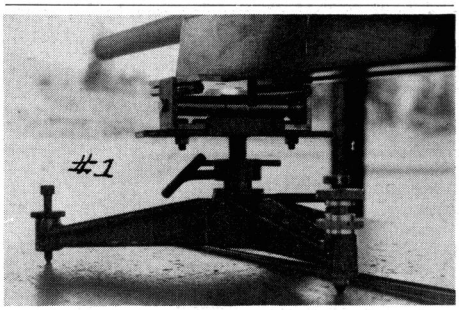
Numbers 3 and 4 illustrate the simplest form of "back-to-battery" front rests. Gravity positions the forearm against the stops on the horizontally inclined rest as the rifle is pushed forward after recoil.

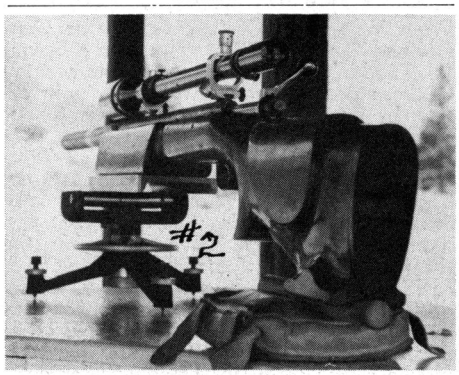
Numbers 5 and 6 illustrate two Open class rear rests with the rifle stocks resting in them.

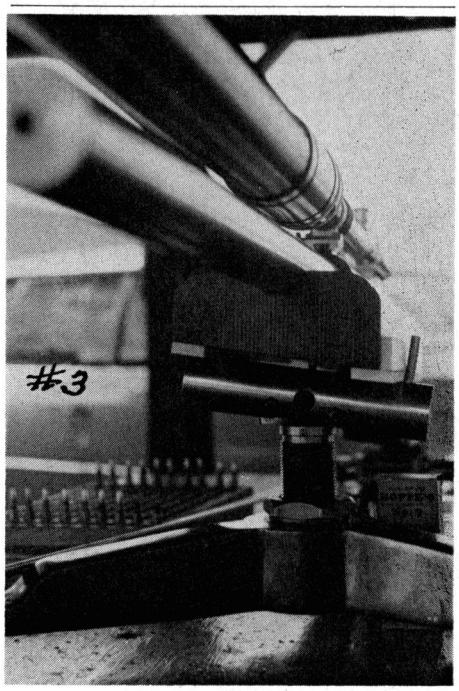
Numbers 7 and 8 illustrate top and front end views of a more complicated and unorthodox Open class rifle and its front rest.

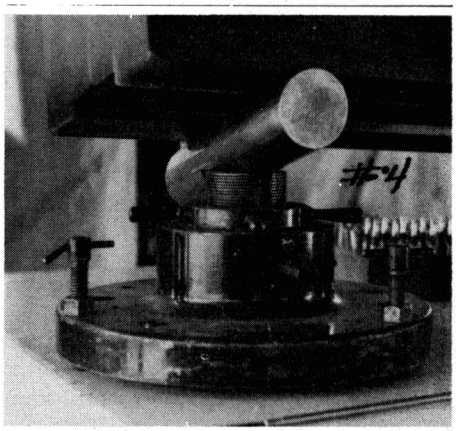
Photos number 9 through 14 were made by John Collins, Rochester, N. Y. and the writer at the Johnstown, N. Y. Labor Day Shoot, 1964.

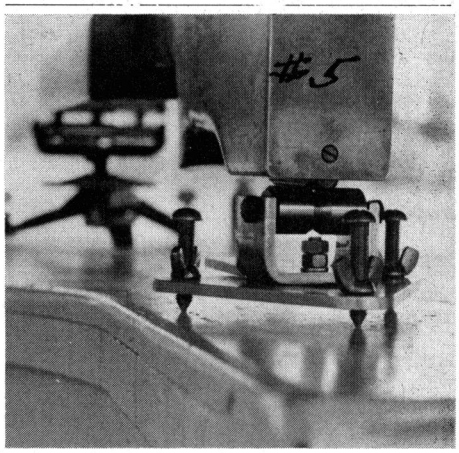
(Continued on Page Six)

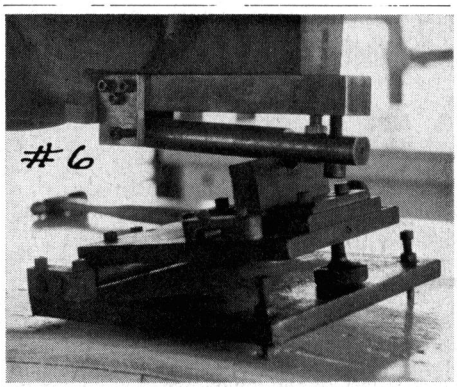


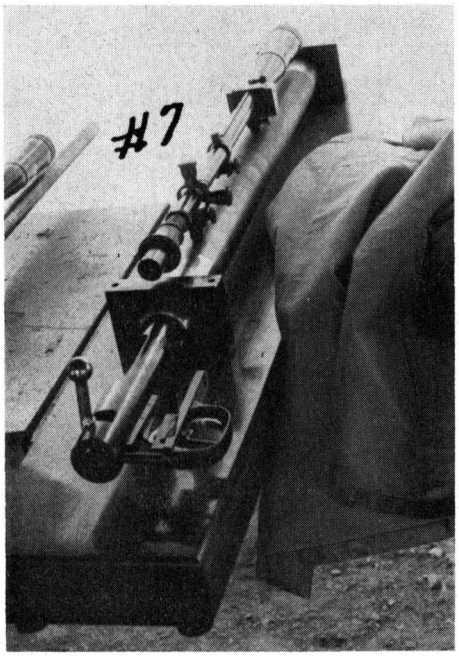


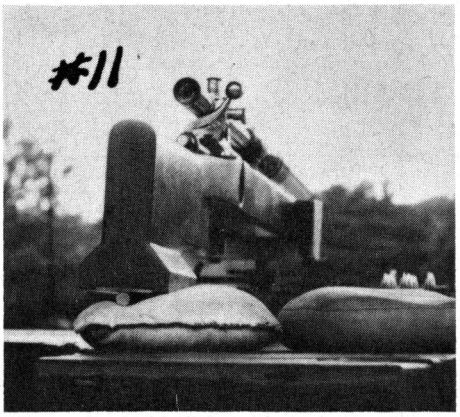


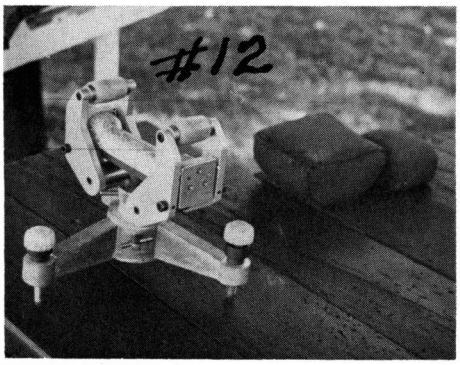


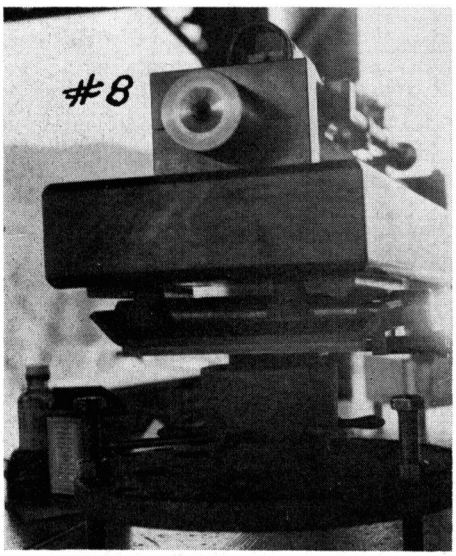


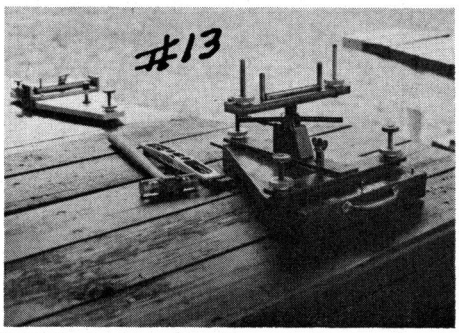


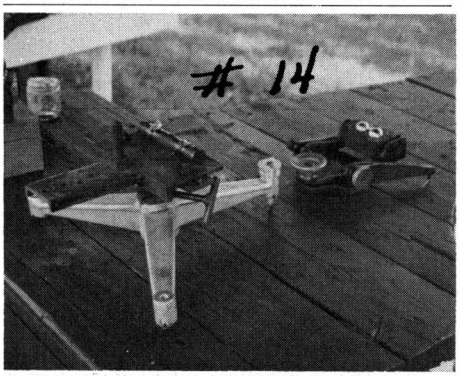


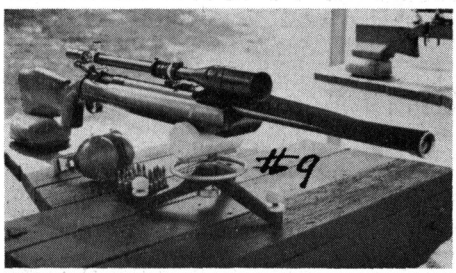


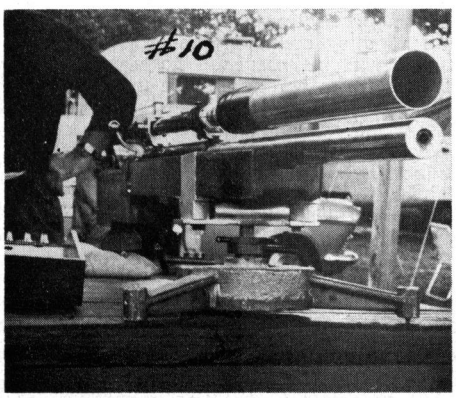


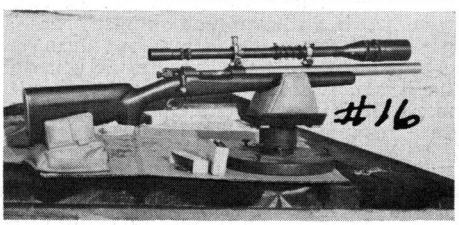












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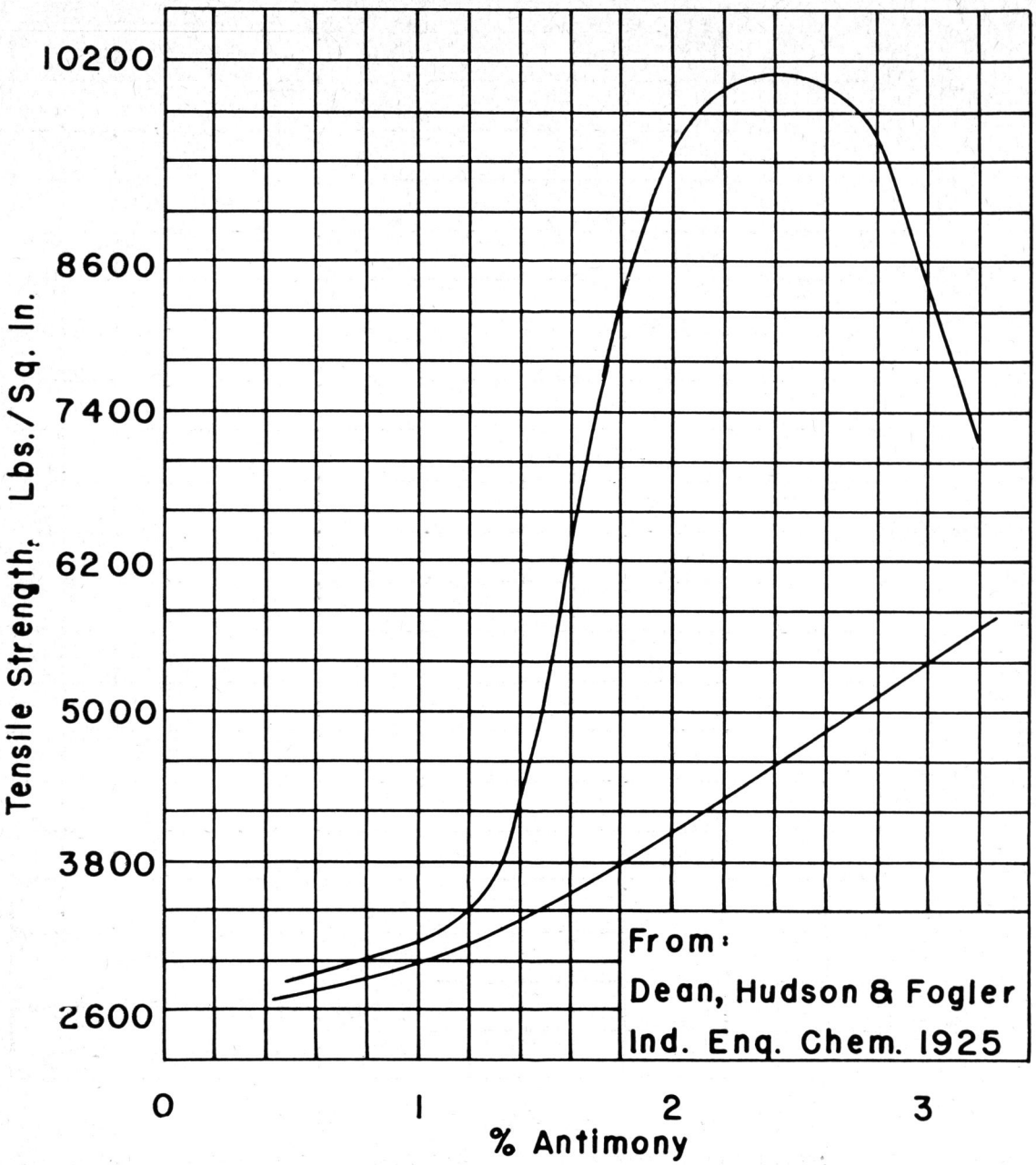

Fig.1 Tensile strength of antimony-lead alloys, before and after heat treatment. Upper curve; after heat treatment. Lower curve; no heat treatment.

BENCHREST RIFLE RESTS

(Continued from Page Five)

Number 9 is a very conventional rifle in Limited class rests. Note the front rest contoured to fit the forearm.

Numbers 10 and 11 are front and rear views of the same rifle in Limited class rests.

Number 12 is an unusual style of front rest. The spring-loaded rocker sidearms are apparently designed to fit sloping sides of a forearm.

Numbers 13 and 14 are examples of Open class rests.

Photo number 15 was made by the writer at one of the non-registered shoots on his home-club range near Lyndonville, in 1964. The rifle and rests are conventional, simple and quite practical for competitive shooting. This rig belongs to Raymond Bosley, Winooski, Vt. and he does very good shooting with it.

Number 16 illustrates a set of sand bags that the writer now uses almost exclusively for shooting his field-sporter and *Marksman type target stocked rifles.* The bags are made and marketed by Basil Tuller, Galeton, Pennsylvania. The bags are craftsman made of top quality leather and keep their contoured shape through years of use. As shown in the photo, on the flat metal tray of the pedestal, the front bag had a tendency to be dragged to the rear in recoil by friction of the wooden forearm on the leather. But with that front bag positioned on a block of wood, the bottom sticks to the wood and stays in place, just as Mr. Tuller initially advised that it would. The rear "Rabbit Ear" bag is now used by quite a number of competiitve shooters but I have never observed the front bag being used in competition.

HEAT TREATMENT AND AGE HARDENING OF BULLET ALLOYS

By A. J. Hammer

Part 1 of 3 Parts

The 2.5% Antimony—97.5% Lead Alloy

A short article by James V. King (1) (Numbers in parentheses refer to references listed in the bibliography at the end of this article.) called attention to the fact that bullets cast from common bullet alloys could be hardened considerably by a simple procedure of heat treatment. E. H. Harrison (2) has shown that antimony has a greater effect in hardening lead than an *equal amount of tin. Because the price of* tin is almost four times the price of antimony, it is more economical to use antimony as the hardening agent.

Reference to the article mentioned by King (3) and to several articles in technical journals disclosed that a great deal of research has been done on the heat treatment and age hardening of lead alloys, most of which has been done on antimony-lead alloys because of their importance in industry.

Applying the data from some of this research to cast bullets, it is possible to use much less antimony and after an appropriate heat treatment, obtain bullets with a Brinell hardness number considerably above that of any untreated antimony-lead alloy. The maximum hardness attainable in untreated antimony-lead alloys is said to occur in a 10% antimony—90% lead alloy. This alloy has a Brinell hardness of about 17. By a heating-quenching-aging process, a lead alloy containing less than 3% antimony can be hardened to approximately 1.6 times the hardness of an untreated 10% antimony—90% lead alloy.

R. S. Dean and co-workers of the Western Electric Company Development Laboratories have made an extensive study of lead alloys containing low percents of antimony (4, 5, 6). Their interest in the *lead-antimony system was from the stand*point of the manufacture of an improved cable sheath, and was particularly concerned with lead alloys containing about 2% antimony. They found that when a series of lead-antimony alloys was heated at 460-469°F. for several hours, quenched in wa-

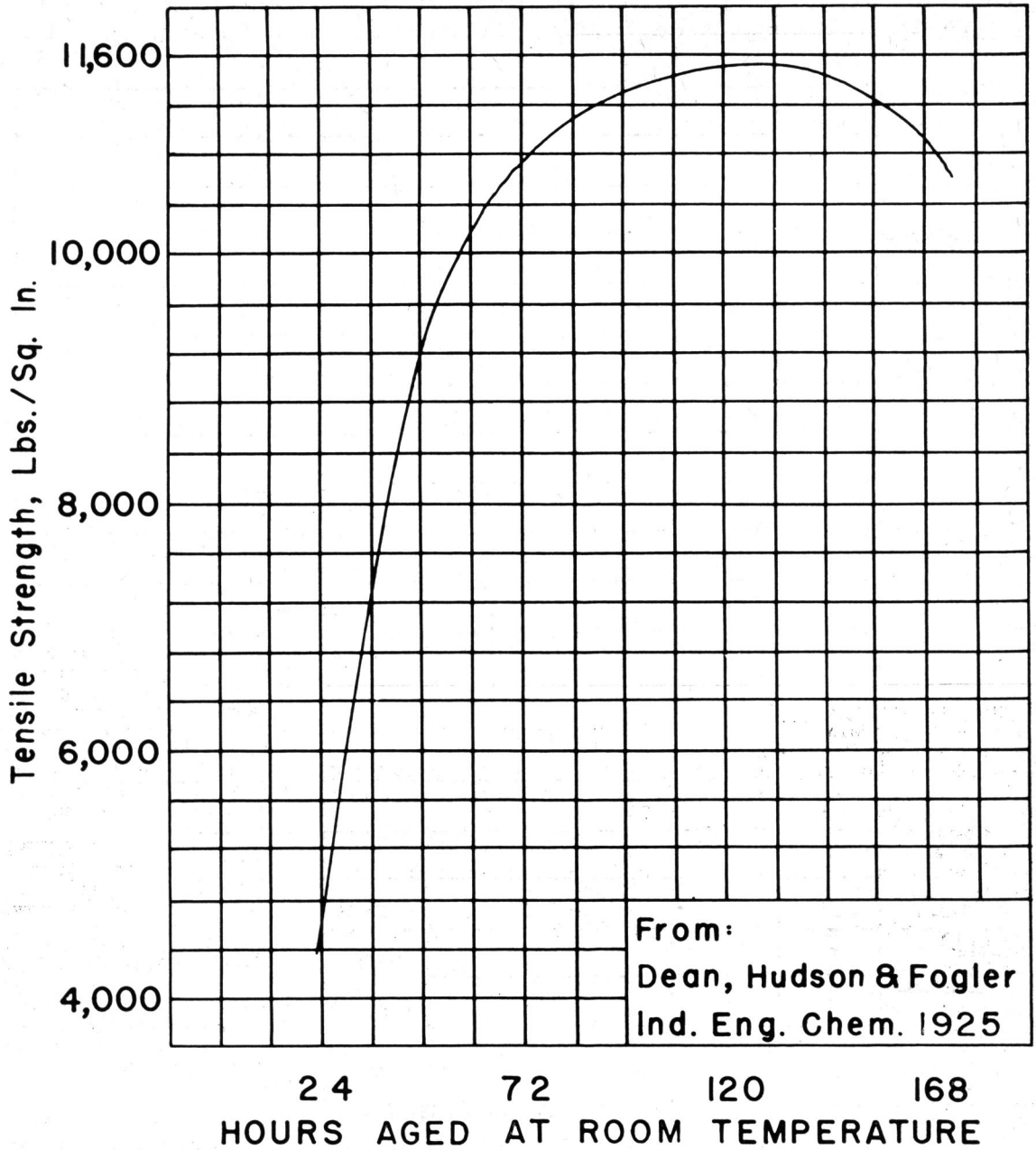

Fig. 2 Change in tensile strength of heat-treated 2.5% antimony—97.5% lead alloy during aging.

ter and allowed to age at room temperature for 24 hours, the alloy containing approximately 2.5% antimony showed the greatest increase in tensile strength (5). Those alloys with greater or less antimony contents showed lesser increases in tensile strength after this treatment. Their data are shown graphically in Fig. 1. A rough approximation of the Brinell hardness of these alloys may be obtained by multiplying the tensile strength by 0.0024.

It is known that the hardness of lead alloys containing antimony changes as they are aged at room temperatures. Alloys that are given a heat treatment show a rapid increase in hardness after quenching during the early period of the aging process, after which the hardness gradually decreases. Lead alloys containing antimony, that are not heat-treated, show a gradual increase in hardness during aging at room temperature.

In Fig. 2, data from an experiment by Dean et al (5) are given graphically showing the change in tensile strength of a 2.5% antimony—97.5% lead alloy after heating at 460°F., quenching and aging at room temperature. After this treatment, the alloy reached its maximum tensile strength after aging for about 126 hours at room temperature.

Several patents covering processes for improving lead-antimony alloys (7, 8, 9, 10) have been issued to Dean and others. All of these patents have now expired so the processes may be used by anyone. The first of these patents (7) gives the details of the method which produces the greatest increase in hardness. These specify an alloy containing 2.5% antimony—97.5% lead; a heat treatment of 72 hours at 464°F. and quenching in water at room temperature. Although this process produces an alloy of Brinell hardness 28 from an alloy of Brinell hardness 8.7, the details of the process are not critical. As will be shown in a later article, the composition of the alloy, temperature of heat treatment, etc. may be varied over rather wide limits and still obtain alloys which are much harder than the untreated alloys of the same composition. Many commonly used bullet alloys which contain antimony can be hardened considerably by a similar treatment.

The 2.5% antimony—97.5% lead alloy, after heat treatment, quenching and aging, is one of the hardest lead-base alloys available for bullet casting. It offers several advantages over the more commonly used alloys of similar hardness.

Perhaps the most important advantage of this alloy to the average handloader is the lower cost. Using the prices of antimony, lead and tin as $0.325, $0.11 and $1.109 per pound respectively, table I was constructed, using several of the harder alloys with Brinell numbers in the range of 28. The maximum and minimum Brinell numbers of four alloys are included to show the range in hardness that may be obtained with these alloys by appropriate heat treatments. Two popular tin-lead alloys are included for comparison.

Table II gives the cost per 1,000 bullets of several of the popular .38 and .45 bullets, based on the above prices of the alloying metals, and made from the alloys listed in Table I.

In addition to the lower cost of the hardened 2.5% antimony bullets, those made from this alloy will be several grains heavier than those made from other hard alloys. For example, the Hensley & Gibbs No. 130 bullet will weigh about 201 grains when cast from the 2.5% antimony alloy and about 192 grains when cast from the 1:1:18 alloy.

Pure lead has a melting point higher than that of any of the commonly used bullet casting alloys. When alloying metals such as tin and/or antimony are added to lead, the resulting alloy will have a melting point (More correctly called the liquidus of an alloy.) below that of lead. This suggests a general rule which will apply to all of the commonly used bullet casting alloys. **The harder the alloy, the lower will be its melting point.** This rule

(Continued on Page Eight)

Table I.

Cost of Metals in 100 lbs. of Bullet Alloy

Alloy	Per cent Composition			Brinell	Cost of
	Antimony	Tin	Lead	Number	Metals
2.5A	2.5	—	97.5	8.7-28	$11.54
Weaver 147 (11)	22.1	8.0	69.9	28.5	23.74
Weaver 149 (11)	18.2	10.0	71.8	28.5	24.82
Weaver 153 (11)	15.9	11.9	72.2	28.5	26.31
Monotype (12)	16.5	7	76.5	26	21.52
Stereotype (12)	13.0	7	80	22	20.78
1 : 1 : 18	5	5	90	16-26	17.07
1:10	—	9.9	90.9	11	20.08
1:20	—	4.8	95.2	8	15.76
5A	5	—	95	11-22	12.07
3A2T	3	2	95	12-28	13.64

Table II.

Cost of Metal for 1,000 Bullets

Alloy	H. & G. 50BB	Lyman 358246	H. & G. 78	H. & G. 130	Lyman 45266
2.5A	$2.41	$2.50	$3.76	$3.19	$3.65
Weaver 147 (11)	4.21	4.36	6.56	5.79	6.38
Weaver 149 (11)	4.48	4.64	6.97	6.15	6.77
Weaver 153 (11)	4.75	4.92	7.41	6.51	7.18
Monotype (12)	3.96	4.10	6.17	5.44	6.00
Streeotype (12)	3.91	4.04	6.10	5.37	5.92
1 : 1 : 18	3.41	3.53	5.32	4.69	5.17
1:10	4.06	4.21	6.33	5.70	6.14
1:20	3.27	3:37	5.08	4.38	4.93
5A	2.48	2.57	3.87	3.40	3.75
3A2T	2.81	2.91	4.37	3.85	4.25

1ST AD HEAT TREATMENT AND ....

(Continued from Page Seven)

does not apply to the 2.5% antimony—97.5% lead alloy which has a melting point of about 617°F. as compared with the melting point of 463°F. for linotype metal with a Brinell hardness of 22.

It has been demonstrated that cast bullets sometimes show differences in hardness when measured at different points on their surfaces (13). This is caused by differences in the rate of crystallization of the alloy during solidification and produces areas which may be of different hardness than the remainder of the bullet. The heating-quenching-aging process produces a homogeneous alloy and bullets treated in this manner would not show the variation in hardness at different points on the surface.

Another variation which has been observed in cast bullets is that some bullets will be harder than others cast from the same alloy, sometimes as much as 9 Brinell numbers. One explanation of this variation in hardness is concerned with the differences in the rates of cooling of different bullets. If hot bullets are allowed to accumulate in a pile, those near the center of the pile will cool more slowly than those at the edge of the pile, or those isolated from the main lot of bullets. If the entire lot is treated by a heating-quenching-aging process, all bullets from the same alloy will have uniform hardness.

Manufacturers of bullet swaging presses usually recommend swaging the bullets from pure lead. Several of the low antimony alloys can also be swaged satisfactorily. Kent Bellah (14) has used a 3% antimony alloy in his C-H Swag-O-Matic press and this writer has swaged .38 bullets from the 2.5% antimony-lead cores cast with the Lyman core casting mold, using the C-H Swag-O-Matic press.

For the handloader who prefers a harder swaged bullet than those made from lead cores by the conventional swaging process, bullets can be swaged from low-antimony alloys, either cast with the Lyman core casting mold or cut from core wire. These formed bullets can then be hardened by a heating-quenching-aging process to give bullets with Brinell hardness of almost any desired value up to approximately 28, depending on the temperature and time used in the heat treatment.

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INTERNAL BALLISTICS—O

Edward M. Yard

Experimental Ballistics Associates

Still preliminary to plunging into the main stream of interior ballistics, we'd like to pursue the idea of powders as fuels, and to delve into their properties in this regard. They are, after all, the basis of fire arms.

Having posed the gun as a heat engine, and pictured it as an efficient one in the 30% class; How may this idea be put to use? We cited how in the last one of this series, but gave no examples. It may be well to see how this machine efficiency of guns may be utilized in practical load development.

You'll remember that we've said velocity is the key measure of any small arms load (and dismissed the idea velocity has any importance except as a figure in ballistics). Thus a chronograph must be considered available to anyone working in this area, or that accurate chronograph results are at hand for loads to be discussed. Since, as we have pointed out M. E.=½ M V2, velocity must be known to work with energy and efficiency values in guns.

Also, in our earlier preliminary comments, powder energy was introduced as a basic element of interior ballistics. It is, indeed, a vital factor in what happens within guns. And much more about what this has to do with things will come to you in later papers. For now we're concerned with the relation of available energy to output. Obviously, if we're talking efficiency and conservation of energy (and we are), we MUST know the energy in the powder itself to relate any ballistics results one to another.

POWDER ENERGY

IT'S The Energy in that powder that makes a bullet go, and each bullet has a good percentage of that powder power in it. Knowing that each ball picks up about a fixed percentage of its propellant's force, if we could know what each explosive had in it, results could be figured. How and where do we get this information? AND that is a good question.

So far as I know, only some general data that compares the single and double base powders has been published, and the topic is usually ignored. General and average figures do help, but they are not equal to good values for each propellant. Only with such data can you really work out the answers.

A Bomb Calorimeter is used to test fuel values of all combustible materials. It may be used for powders also, as these are combustibles. Because very high pressures can't be tolerated, calorimeter bombs have volumes large compared to gun bores. Burning is therefore at a low average pressure. And the bomb contains enough air to increase the oxidation of the powder, yielding slightly higher values than a gun will produce. The figures are still comparative, and may be used to evaluate powders. It would be next in line to purge the bomb with nitrogen, or to evacuate it, getting values still closer to the heat release occurring in guns. But this still would not correct of the heat of vaporization of water in the combustion gasses. Actually the air filled calorimeter figures give good comparative values, sufficient for our present need.

In a load both heat content of the powder per unit weight and the powder density affect the actual total heat release when full cases are being compared. This means that for a particular cartridge, with a specific volume, the density of the propellant determines the weight that a maximum charge can have, and the product of this and unit heat content is maximum heat release. Since it is simple enough to find how much of any powder you put into a

cartridge case, this total available energy is easily found, IF we can obtain the heat content of the powders we use.

WHAT IS POWDER ? ?

We certainly don't intend to answer that question fully.

The release of energy in combustibles and materials like the propellant powders is the accompaniment of oxidation-reduction reactions. In simplified terms, a fuel like carbon is oxidized by combining chemically with oxygen, a lower energy level is reached and heat is given off. The burning of coal, oil, or gas in air occurs when a temperature high enough starts the oxidation of these by the oxygen in the air.

A propellant powder is made of both fuel and oxidant. Powders do not need air to make them burn. They will burn rapidly or explode in tightly sealed confined spaces, and their release of heat (energy) may result in great force. To use them as explosives requires this characteristic.

Great Force is needed to get a bullet going within the short confines of a gun barrel. Powders deliver just such a shove. If we understand that this is so, then other aspects of ballistics (interior and exterior) will be easier. The equation defining this is: $V2=2as$ or $a=V2/2s$ where, V is velocity in F.p.s., s is distance traveled in the barrel, and a is acceleration. Acceleration increases as the square of V.

For a typical example, in which we wish to fire a 50 grain .22 Cal. bullet at 3000 F.p.s. from a 20 inch barrel:

a=3000 x 3000/
2 x 1.667=2,700,000 Feet per Sec.2

This is the mean acceleration needed to attain that velocity. The mean pressure may be calculated using Newton's second law of motion:

F=ma (Force =mass times acceleration)

F=PA, also (P is pressure, and A is bore area) Then PA=ma, and so

P=2,700,000 x 50 / .0381 x 225, 120

P=15,750 P.s.i. Mean Effective Pressure

The meaning of this is that an average of that much pressure must be exerted on the bullet from cartridge to muzzle. Since no easy nor economical way is available to produce steady pressures, propellant powders that explode to a high pressure and then by gas expansion drop as the bullet moves out of the barrel are commonly used. Every automobile engine works the same way.

A powder is what gives us these huge forces to ram bullets through barrel and up to destructive speed. These self-contained fuel and oxidizer combinations have to be concocted to burn very speedily to get the high pressure we see is needed, but must not burn so fast as to reach too high a pressure. And this is the prime problem of internal ballistics. Further inquiry will show what factors relate to this.

Powder is material that will burn so rapidly as to cause explosion, and, to be useful, at a rate which will avoid an explosion of the guns it may be used in. Solids that may rearrange chemically to become gasses, at the same time releasing considerable energy, are the materials used.

MAXIMUM PRESSURE

While it is the M. E. P. that DETERMINES M. V., it is maximum pressure which controls suitability of a load. Peak pressure with any practical powder is a multiple of the mean pressure, usually several times as much. For the instance we show, about three is the likely factor, while one of four or five would lead into dangerous and very dangerous territory. One could tend to brush off this idea, looking at the modest M. E. P. of 15,750 P.s.i. and noting that we sell over the counter hundreds of loads that involve similar figures. It is so.

The fact is that a factor of four or five WOULD be dangerous, AND, which is most important, is **very VERY POSSIBLE.** It is only the caution and adherence to sound advice of beginning handloaders that keeps them from disaster, most of the time. Powders have the energy needed to wreck any small firearm if all we do is impede the motion of the bullet. Guns cannot withstand the full energy of most powder charges as closed chambers.

A primary function of the study of interior ballistics is to learn to control the impulsive release of energy by propellant powders. Newton's laws of motion and the calculus he invented to work with these are the most important knowledge required, and basic physics is next, some chemistry also needed.

While these materials may be used to blow bombs to bits, proper knowledge can control their application to small firearms for safe and useful results.

AN EXAMPLE

All of this rambling on about a subject is no good. We want to put it to use. We will give you a taste of what we hope can become your common experience.

I'd always wanted a light handy and neat little rifle for the deer woods. So I made me up a .357 Magnum on the BSA Martini Cadet with a 20 inch barrel, and complete with Bushnell Phantom Scope and sling it weighs in less than 5½ lbs. . . . What's this to do with internal ballistics??

I want deer killing loads for it. That's what.

Suppose I filled up the case with 4227 and topped that with a Speer 160 grain jacketed swaged bullet, who can deny that I'll bag deer with it in the woods any time there are deer to bag? You may be sure that this load will do the job. Only the bearish ballistician will twitch his nose in tentative disdain, muttering 'well, now' and with his pencil look for more.

The factory load with a 158 grain bullet is rated 1925 F.p.s. That load we're yammering about would be 20.0 grains of 4227, and it chronographs at 1975 F.p.s., or up on the pros. IT's easy to be from Missouri and to drop out the home work, looking at that. But if you want to play at ballistics, stick to your facts, stick to your guns, and watch your pressure signs!!

4227 in the bomb calorimeter gave 1860 B.t.u. per pound. 20.0 grains has 4140 Ft. lbs. of energy. A 160 grain bullet at 1975 F.p.s. has 1385 Ft. lbs. and the efficiency is 33.4% in this gun. Since I filled up the case this is the sky.

The bomb calorimeter shows 2500 B.t.u. for H240 powder that may be used in the .357, somewhat. 17.0 grains nestle neatly under the same Speer bullet. This has 4700 Ft. lbs. of explosive effort tucked in it. At the same efficiency this would predict 1570 Ft. lbs. of energy which calculates out to 2100 F.p.s.

JUST POSSIBLY your interest in interior ballistics is rising . . .?

If this were a mystery thriller, we'd have to leave you up in the air about the real results. Being merely a technical writer, and careless of P. S. space at that, we'll let you have the answer this installment. The load was duly loaded and chronographed, and at 2100 F.p.s.

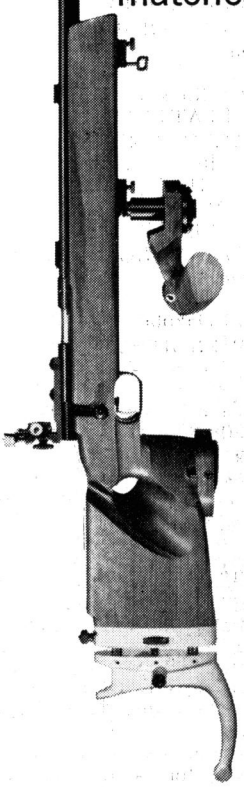
WATCH YOUR PRESSURE SIGNS! And we did. Those cases fell out of the Martini at a finger tip push on the lever like BBs through a glass pea shooter.

Before we get carried away here, let's face the fact that figures DIDN'T make this possible. They only explain what was there. Sometimes figures can find what IS there. That's the purpose of studying internal ballistics and using figures. There's a lot more to do to get most of the answers, and if you want them don't let your P. S. subscription lapse. More is coming.

(**Note:** Certain facts in these examples will be contradicted later, so draw no conclusions until later chapters have been read.)

olympic selection

Anschutz dominates international smallbore matches



At the 1963 European Championships in Oslo, 31 of 48 competitors in the 3-position match—and 9 of 12 winners—shot an Anschutz. The Match 54 has walked off with a major share of the honors at Sao Paulo, Cairo, Moscow—at every recent international match.

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Model 1411, not shown, is the same superlative Match 54 action in a U.S. match-type stock. Weight 11 lbs. $145 (sights extra; left-hand stock, $157).

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PRESIDENT'S CORNER

This will be my final presentation of the President's Corner while holding office as N. B. R. S. A. president. I hope not to make it too long, but feel it being my last, I'll be forced to fill a page or two.

First of all, I wish to thank all Directors and Officers for their fine cooperation they have so graciously extended to me, and to the members for so many nice letters received from them. I know there have been times when I have found this position hectic and also when I have "blown my top," but may I ask you to show me a president who has not reached this point at some time during his presidency and I'll show you an inactive president who, in short words, we will call "deadwood." Often the times have been very trying, but I have kept my promise never to let myself weaken, although many times I have found myself up in the wee hours of the morning answering a member's request. Many times I have asked other members to assist me, which was always done. This alone is a great help to any president, knowing he has a group of members backing him. My Regional Directors have performed every task asked of them. Many times members have asked "why the delay?", but due to the many miles between us, it takes time. I hope before the end of the month to have all letters on my desk answered. This is one of the duties I feel the president should perform, as they might seem of little importance to him, but to the sender they are of great value. This alone is very time-consuming, but will reap a fine return.

Being president of N. B. R. S. A. for two years was very enjoyable—one is always hearing from all corners of our nation; receiving the shoot reports from all groups will be greatly missed by me. I anxiously awaited their arrivals more than I did the evening newspaper.

Your new president, Brunon Boroszewski, I know will do his utmost to serve you in any way and your new vice-president, L. F. (Bud) Carden will always be backing him in every way possible. Your deserving secretary, Mrs. Bernice McMullen will (as in the past) be anxious to help you in any way she can. Your Regional Directors are awaiting your problems and help. With such a great working force elected by you we are bound to grow larger, both in membership and harmony.

Due to my absence for part of the annual meeting and also for an evening missed by our secretary, a full report of the minutes has been temporarily delayed. Please bear with us and we hope to have them for you to read in the next issue.

The new Rules Book is being worked on by all Directors and assigned committees. This, too, is taking a great length of time. We feel if we can have a limited time for discussions, proposals, etc., we will be able to present to you a Rules Book that will not be changed every time we attend a National Meet. Changing of rules is one of our weakest points. It keeps all members in a turmoil and the results are we go around in circles. Who suffers? You, the shooters who never know whether your guns will be legal or illegal soon after you have them or make them. Also, the clubs who have definite ideas of the rules and the president by getting a mailbox full of complaining letters that he has to answer. I feel we should keep our rules book stable and stationary until they are proved wrong by not just a few months of testing, but a year or two. This has been the main complaint of most members and I must agree with them 100%. Too many of our members instead of abiding by the rules search for loopholes—this we should avoid. One must always remember we are in this for fun and should act accordingly.

A president must carry many responsibilities. He must always act in behalf of all the members, and not a few. Many times I have been asked by one or two persons to change something and have been continuously hounded by such. To their surprise, this accomplished nothing.

I have had the experience while being president of also being director of a Region. This is a very bad thing to do. When you wish to speak as a director some members take your writing or conversation as president, and vice versa. In Mr. Wilson's letter that will follow this is an example on the barrel situation. As you will notice in the November issue of "Precision Shooting" it was not in the President's Corner, but directly after the closing of that column. This was written in behalf of the Mississippi Valley Region, and not as President of the N. B. R. S. A. Many complications can arise by the president holding more than one office. I am enclosing a group of letters to follow the "President's Corner" and you will notice that they are after my signature and not before it. I think all members should be heard and if their letters warrant publication it should be done. I feel all letters written to the president are the property of the N. B. R. S. A. and should be published if he deems it necessary unless notified by the writer not to do so.

As I wind up my two years in office, on behalf of myself and my wife, who helped me so endlessly, I wish to thank you from the bottom of my heart. I hope the President's Corner will be continued by our next president. I shall bring my rifles from the mothballs and next year will be among you on the firing line.

Thanks again for giving me the opportunity to do my part for such a great organization, and Season's Greetings to each of you.

As ever,
A. W. Walter, Pres.
N. B. R. S. A.

NOTICE TO MEMBERS OF EASTERN REGION NBRSA

The annual winter meeting of the Eastern Region, National Bench Rest Shooters Association, will be held at the Midtown Tower Hotel, Rochester, New York, on January 23rd and 24th, 1965. The Saturday morning session will start at 9:00 A. M.

The change of the location and choice was the result of a thorough study by a committee of Ed Seymour, Sig Gucfa and your present Director. We invite all of you to attend. The better the turnout the better a job we can do. Lets get out and show Doc Garcelon, our new Director-elect, that we're with him all the way.

Hotel reservations may be made direct with the hotel. This is a beautiful location and for the benefit of the ladies; the hotel is part of an indoor mall shopping area.

Brunon V. Boroszewski
Director, Eastern Region
N. B. R. S. A., Inc.

Bench Rest Match Reports

SOUTHWEST REGIONAL CHAMPIONSHIPS

On October 10th and 11th the Modesto Rifle Club (California) was host for the Southwest Regional Championship Tournament. There were 23 shooters to make a total of 80 competitors in the various classes and events.

A light sprinkle of rain on Saturday morning, just before the shoot, only seemed to settle the dust; otherwise for the rest of the tournament the weather was very good, very little wind or mirage.

The high ranking aggregates in the various classes were by:

	100	200	Grand
Unrestricted, Open Class			
Allen Hobbs	.4482	.4218	.4350
Ed Suchan	.4498	.4837	.4667
Chet Pluth	.5640	.4375	.5007
Virginia Jones	.5300	.6197	.5748
Unrestricted, Limited Class			
Virginia Jones	.5402	.6273	.5338
Ken Jones	.5806	.7482	.6644
Henry Smith	.6794	.7109	.6951
Len Shephard	.6622	.7755	.7187
Heavy Varmint			
Ed Suchan	.3846	.5076	.4461
Allen Hobbs	.4530	.5019	.4774
Kit Puett	.4302	.6660	.5481
Tom Squires	.5020	.5850	.5435
Lee Brewer	.4296		

(Continued on Page Twelve)

EQUIPMENT AND LOADS USED BY "TOP-TWENTY"

	Agg. Class	Caliber Scope	Action Barrel	Barrel Length Diameter	Total Weight	Powder Charge	Bullet Primer
Homer L. Culver Arlington, Va.	.4705 Ltd.	.308 Unertl 24X	Culver Hart	28 inches 1.375 inch	25 lbs.	H380 48 grs.	Own 168 gr. CCI Mag.
Brunon Boroszewski Orchard Park, N. Y.	.4754 Ltd.	.308 B&L 24X	Rem. 722 Hart	30 inches 1.375 inch	42 lbs.	H380 49 grs.	B&A 160 gr. Fed. Mag.
Chester J. Pluth Lakeport, Calif.	.4931 Open	.222 Unertl 36X .222 Mag. Lyman 30X	Shilen Hart Hart Hart	30 inches 1.375 inch 30 inches 1.250 inch	135 lbs. 150 lbs.	Ball-C 23.5 grs. Ball-C 26.5 grs.	Own 50 gr. Rem. Own 50 gr. Rem.
Paul O. Gottschall Salem, Ohio	.5208 Ltd.	.222½ Unertl 24X	Own Hart	29 inches 1.250 inch	25 lbs.	4198 22.8 grs.	B&A 53 gr. Rem. 6½
Robert W. Hart Nescopeck, Pa.	.5337 Ltd.	.308 Unertl 24X	Hart Hart	29 inches 1.350 inch	26 lbs.	H380 48 grs.	Sierra 168 gr. CCI Mag.
Ralph W. Stolle Sea Brook, Md.	.5423 Ltd.	.308 Unertl 20X	Culver Hart	29 inches 1.375 inch	42 lbs.	H380 48 grs.	Sierra 168 gr. RWS
Eldon L. Stolle Seabrook, Md.	.5436 Ltd.	.22-45 Unertl 24X	Culver Hart	28 inches 1.250 inch	19 lbs.	4198 21 grs.	Culver 52 gr. RWS
Horace E. Powers Okmulgee, Okla.	.5490 Open	.220 PS Unertl 36X	Powers Hart	29 inches 1.375 inch	30 lbs.	3031 30 grs.	Own 55 gr. Rem. 9½
Bernice McMullen Minerva, Ohio	.5495 Ltd.	.222½ Unertl 24X .308 Unertl 24X	Rem. 722 Hart Culver Hart	28 inches 1.250 inch 29 inches 1.375 inch	20 lbs. — —	4198 22.2 grs. H380 48.5 grs.	B&A 52 gr. Rem. Culver 168 gr. CCI
George E. Kelbly Rittman, Ohio	.5542 Ltd.	.30 Jet Lyman 30X	Mauser Hart	29½ inches — —	35 lbs.	H380 49 grs.	Sierra 168 gr. CCI Mag.
Cline Deere Washington C. H., Ohio	.5659 Open	.308 Unertl 24X	Mauser 98 Hart	30 inches 1.3125 inch	35 lbs.	4895 42 grs.	Sierra CCI Mag.
Clyde E. Yockey Apollo, Pa.	.5697 Open	.219 Unertl 24X .308 Unertl 24X	Rem. Hart Rem. Hart	25½ inches — — 26 inches 1.375 inch	— — — —	Ball-C 28 grs. H380 48 grs.	Culver CCI Sierra CCI
L. F. Carden Kansas City, Kans.	.5717 Open	.222 Lyman 20X .222-70 Lyman 20X	Baucher Hart Baucher Hart	27 inches — — 27 inches 1.250 inch	— — — —	Ball-C 23 grs. Ball-C 26.7 grs.	B&A 50 gr. RWS B&A 52 gr. RWS
M. M. Oakley Seattle, Wash.	.5901 Open	.222 Unertl 24X	Hart Hart	28 inches 1.250 inch	— —	Ball-C1 23.5 grs.	Bahler CCI
L. S. Rucker Akron, Ohio	.6098 Open	.308 Jet Lyman 30X	Weber Hart	28 inches 1.375 inch	26 lbs.	H380 48 grs.	Rucker 167 gr. CCI Mag.
I. E. Potter Kettering, Ohio	.6115 Open	.222½ B&L 24X	Rem. Hart	28 inches 1.375 inch	35 lbs.	Ball-C 25 grs.	B&A 52 gr. CCI
Larry Engelbrecht Wichita, Kans.	.6298 Open	.222 B&L 6-24X	S&L Hart	28 inches 1.250 inch	32 lbs.	Ball-C1 23.9 grs.	Own 51½ gr. RWS
Robert W. Smith Dallas, Texas	.6327 Ltd.	.219 Unertl 24X	FN Mauser Hart	28 inches 1.250 inch	20 lbs.	3031 26.5 grs.	Own 53 gr. CCI & Fed.
L. E. Wilson Cashmere, Wash.	.6366 Open	.222 Unertl 32X .308 Lyman 20X	Own Hart M-70 Day	26 inches 1.500 inch 30 inches 1.500 inch	46 lbs. 46 lbs.	Ball-C 26 grs. H380 50.5 grs.	Own 59 gr. Rem. Own 167 gr. Rem.
Wallace E. Hart Nescopeck, Pa.	.6391 Ltd.	.308 Unertl 24X	Hart Hart	29 inches 1.350 inch	26 lbs.	H380 48 grs.	Sierra 168 gr. CCI Mag.

OVER-ALL EQUIPMENT SURVEY:
CALIBERS: Thirty-eight shot .22 cal. rifles and thirteen shot .30 cal. rifles. Of the .22's there were seventeen .222 Rem., five .222½, three .222 Rem. Magnum, seven 219 Don, and six other .22's. Of the "other" .22's, two were shortened .220 Swift cases. Nine shot .30 cal. at both ranges while four shot .30 at 200 yards and a .22 at 100 yards. Ten of the "Top-Twenty" used .30 cal. and eight of them shot the .30's at both 100 and 200 yard ranges.

BARRELS: Forty-two of the rifles had Hart barrels, six had barrels by A. L. Day of Tulsa, Okla. and three had Douglas barrels. (Six of the competitors used two rifles, two of them using two .22 rifles.)

With one exception, ALL barrels were listed as having 1 in 14" twist. The one exception was an A. L. Day barrel in .30 cal. with **1 in 16"** twist. The shooter, who has not as yet become a consistent winner in matches, placed 27th in the four-day grand aggregate with an aggregate of .6704 MOA. He aggregated .5064 for the two days of 100 yard shooting and 21st for the two days 200 yard shooting with .8345 MOA. He used in his .308 case what seems a present pretty standard powder charge of 48 grs. H380 with 148 gr. bullets handmade in B&A dies.

ACTIONS were in great variety. Mausers, from military '98 to present FN, led the list with ten. Eight used the custom made Weber actions. Of the factory-made actions there were six Remington, four Schultz and Larsen, two Winchester M-70 and one Sako. Of other custom made actions, there were five Hart, four listed as "own," three Baucher, one each Powers and Shilen.

SCOPE representation was about normal. There were 34 Unertl, 10 Lyman, 6 Bausch & Lomb and 1 Litschert.

BULLETS: Thirty-five listed hand-made bullets and seventeen factory produced bullets. Of the factory bullets, ten were Sierra (7 of them .30 cal.), four Speer and three Sisk.

POWDER: Twenty-six used Ball-C powder, thirteen used H380 (one in .22 cal.), seven 4198, three 3031, two 4895 (one in .30 cal.), and one H335.

PRIMERS: There was a big gain in CCI primers, a total of 22 used them, ten being the CCI Magnum (seven of the .30 cal. shooters used the CCI magnum, one listed just CCI, one used Federal Magnum, and one RWS). Sixteen used Remington primers, eleven RWS and two Federal.

SOME MUSING by P. H. T. This led to some researching in statistics of past National Championships and, in doing that, I woke up right away to the fact that we now have our second two-time National Champion. Homer Culver won his first Championship at Tulsa in 1960 with an aggregate of .6004 MOA aggregate. In 1962, back at Tulsa, he was 8th ranking shooter with an aggregate of .6195. In 1960 the old course of 100 record shots in a two day event was fired. In 1962 it was the present four-day 200 record shots course.

(Continued on Page Twelve)

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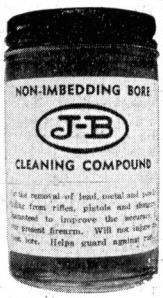

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(Continued from Page Eleven)

Equipment Survey

Compare the foregoing with Homer's winning .4705 MOA this year (1964). Also, consider that the 14th ranking shooter this year had an aggregate under .6000. Homer's aggregate was smaller than Paul Gottschall's championship winning .4737 last year at Wapwallopen, Pa., and Brunon Boroszewski's runner-up aggregate of .4754 this year was only .0009 MOA larger than Sam Wilson's runner-up aggregate last year. However, the 20th ranking shooter last year had an aggregate under .6000 MOA. Without detracting a thing from the fine performance of this year's competitors, I do believe it would be the consensus of opinion that the shooting conditions this year were unusually favorable for the Tulsa range.

I believe the most outstanding development in the last four years has been the increasing success of the .30 caliber rifles in competition. Brunon Boroszewski started serious experimenting with .30 cal. rifles late in 1959. He shot .30 cal. in competition throughout the 1960 season, and since then. George Kelbly soon joined Brunon in the .30 cal. experimenting and development for benchrest competition. They had no outstanding success in competition through the 1961 season but their work began to pay dividends in 1962. At the 1962 National Championships in Tulsa, in two days of rough condition shooting at 200 yards, they came from behind to take the two top spots; Brunon winning the championship with a .5614 MOA aggregate and George taking runner-up spot with .6141. One other shooter used .30 cal. that year but did not place in the top-twenty.

At the 1963 National Championships at Wapwallopen, Pa., seven shot .30 cal., at least four of them only at the 200 yard range. Six of the seven placed in the Top-Twenty, placing 2nd, 6th, 14th, 15th, 19th and 20th. Boroszewski and Kelbly shot .30 cal. at both ranges and took the 19th and 20th places. The statistics for 1964 speak for themselves.

There have been two trend changes during the past several years which I believe are related. The use of the .219 Don cartridge and Federal primers has steadily declined over the past several years. When the .219 Don was in its heyday of popularity, nearly everyone used the Federal 210 primer to prime that case, as did others for similar cases and the Federal primers held top popularity and use among the benchresters. With the growing popularity of the Remington 222 family of cases with the benchresters, Remington primers, especially the No. 6½, made a similar gain, and for some three years past Remington primers have topped the list at benchrest competitions. I can't believe that the .219 Don case is any less accurate than it ever was, or that Federal primers are of any lesser quality. The Remington 222 has proven its accuracy worth, is more convenient than any case that has to be reformed, while it and the Rem. 6½ primer are a natural mating.

This year, for the first time at a national unrestricted rifle match, CCI primers top the primer list. The No. 250 Magnum primer appears to have been good for the .308 loads of H380 powder, but that only accounts for one-third of the CCI primers reported. They are good primers.

Ball-C powder was still popular with the .22 shooters, 26 of them using it. Proven accuracy results, cost, and good "measuring" qualities are undoubtedly factors that influence the popularity of Ball-C powder. Thirteen used H380 powder. H380 in charges of around 48 grs. seems at present to be a standard loading for the .308 case and 12 of the .30 cal. shooters at the National used it. The 13th shooter of H380 used it in a .222 Magnum. His accuracy results at Tulsa would not tend to recommend H380 as a desirable powder for the .222 Mag. case.

BENCH REST MATCH REPORTS

(Continued from Page Ten)

Light Varmint

Ed Suchan	.4504	.6194	.5349
Allen Hobbs	.5120	.6894	.6007
Ray Jones	.6730	.6322	.6526
Earl Jacobsen	.6072	.7056	.6564
Jack Broome		.6535	

EQUIPMENT OF THE CHAMPIONS: Allen Hobbs used a 222 Rem., Remington action, Hart barrel, work by Fullmer, 24X Unertl scope, weight 70 lbs., with load of 20.9 grs. 4198, 52.5 gr. bullets and Rem. primers.

Virginia Jones used a 222 Rem. Magnum, Weber action, Hart barrel, work by Fullmer, 20X Unertl scope, weight 27 lbs., with load of 26 grs. Ball-C, 52 gr. bullet and Rem. primer.

Ed Suchan used for Heavy Varmint class a .219 Don Wasp, Weber action, Hart barrel, 20X Lyman scope, with load of 27.5 grs. Ball-C, 52 gr. bullet and Federal primer. For Light Varmint he used a 222 Rem., Rem. action, Hart barrel, 20X Lyman, with load of 22.5 grs. Ball-C and Rem. primer.

OVERALL EQUIPMENT SUMMARY: Calibers; 222 Rem.—18; 222 Rem. Mag—12; 219 Don Wasp—5; 30 cal.—3; one each 220 Swift, .257 and 6mm Don.

Barrels; 26 Hart; two each Pride and Buhmiller; one each Apex and Walker.

Actions; Remington—9; Weber—6; four each Shilen and Sako 3 Sweany; two each Hart, Mauser, M-70, and Enfield. There were 5 complete Remington 40X rifles.

AUGUSTA, OHIO

On Saturday, October 17th, at Reed's Run Rifle Range, 14 shot 5-shot matches with unrestricted bench rifle and 7 shot Heavy Varmint class matches. On Sunday, October 18th, 18 shot the National Match course of 10-shot matches with Unrestricted class rifles. The high ranking aggregates were:

Unrestricted—5-shot matches

	100	200	Grand
Bernice McMullen	.3354	.3368	.3361
A. H. Angerman	.3402	.5885	.4643
M. J. Toutant	.4420	.5279	.4849
George McMullen	.4348	.5668	.5008
Ralph Pickens	.3296		
George Kelbly	—	.4795	

Heavy Varmint class

Paul Gottschall	.3154	.5776	.4465
Omar Rinehart	.4020	.5596	.4808

Unrestricted—10-shot matches

Ernest Scafuri	.4446	.5310	.4878
A. H. Angerman	.4582	.5193	.4887
Ralph Pickens	.4996	.4954	.4975
Bernice McMullen	.4764	.5202	.4983
Johnson	.4146	.5873	.5009
Clyde Yockey	—	.4909	

KANSAS CITY, KANSAS

The Mill Creek Rifle Club of Kansas City, Kans. held its final Unrestricted Rifle match of the season on October 17th with 14 shooters competing. The high ranking aggregates were:

	100	200	Grand
"Bud" Carden	.413	.5389	.4758
Dixon Herman	.366	.7822	.5741
Walt Berger	.419	.7512	.5851
Horace Powers	.578	.6064	.5922
S. Carson	.511	.8371	.6740
Larry Engelbrecht	.483		
Bernard Geenens	—	.7043	

Southwest Region Benchrest Champions. Left to right; Ed Suchan, Oakland, Calif., Heavy and Light Varmint champion; Allen Hobbs, El Cerito, Calif., Unrestricted Rifle Open class champion; and Virginia Jones, Yreka, Calif., Unrestricted Rifle Limited class champion.

Carden shot a 222 Mag. with Baucher action and Hart barrel weighing 35 lbs. with load of 26.7 grs. Ball-C, 52 gr. B&A bullets and RWS primers.

Herman shot a 219 Don, Taylor & Robbins built rifle with FN action and Hart barrel weighing 25 lbs. with load of 26.5 grs. 3031, 55 gr. B&A bullets and Federal primers.

Berger shot a 222 in Hart barrel on Baucher action weighing 35 lbs. with load of 23 grs. Ball-C, own 52 gr. bullets and RWS primers.

CANTON, OHIO

Sixteen shooters shot the 200 yard Varmint class matches at the Canton-McKinley Rifle Club on October 3rd and 4th. Anderson of the host club was the winner with 250-20 x score and .5116 MOA group aggregate. Davidson had 250-16x—.5165, Waltz 249-15x—.6327, Mervis 247-13x—.8041, and Griffith 247-12x—.6719.

At the October 24th and 25th shoot there were again 16 shooters. Anderson was again the winner with another 250-20x score and a .5062 MOA group aggregate. Newton, shooting in his second match and using a rifle with a home-made action topped by a 10X Weaver scope, was runner-up with 250-17x and .5859 group aggregate. Gottschall with 250-16x—.6864, Rucker 250-14x—.6614, and Rinehart 250-13x—.7055, rounded out the top five.

ST. LOUIS, MISSOURI

The Bench Rest Rifle Club of St. Louis held a "Hunting Rifle" match on their Col. Whelen range, October 18th. This was the second attempt to interest the average hunting rifle shooter in shooting from a bench and rest, and it was a very successful shoot in spite of cold and cloudy weather.

There were two matches; one for scoped rifles up to 6X and one for iron sighted rifles. Calibers were .243 and larger. Weight limit with scope was 10½ lbs. Three 5-shot groups were fired at 100 yards and three 5-shot groups at 200 yards. Total point score with a possible of 300 determined the winners. Targets were bullseye targets rather than bench targets so that "Knowing where the rifle shoots" was necessary for a good score.

Winners in the scope sight matches were: Ken Immekus, Overland, Mo., score of 285-8x using a Sako .243 with a Redfield 3x9 scope. Herb Nevis, St. Louis, score of 282-4x using a .244 Remington with Bushnell variable scope. Dr. Dick King, St. Louis, score of 281-5x using an FN 30-06 with a B&L V8 scope.

Iron sight winners were: Charles Pinson, St. Louis, score of 293-10x using a Browning 30-06. Everett Regge, Milwaukee, Wisc., score of 291-10x using a Springfield. Vincent Dillon, St. Peters, Mo., score of 283-5x using a Springfield 30-06.

by H. J. Vandiver

LETTERS FROM MEMBERS

(Released for publication by NBRSA President, Al Walter)

Cashmere, Wash., Nov. 3, 1964

Dear Al:

Shortly before Ray Speer, our NW director, left for Tulsa I wrote him regarding several things I thought should be brought up before the directors' meeting. Here's what I had to say about this varmint and sporter barrel business:

"Probably some of you people may have noticed that on occasion I have differed with Mr. Chas. Kingsley. However, in a recent letter to PS he brought up a point with which I agree completely. That is the ambiguous situation regarding that .9" muzzle diameter for the sporter, light varmint and heavy varmint. The distance from the receiver at which the barrel must not be over .9" should be given. The idea that a rifle with a 26" barrel measuring .9" at the muzzle can be legal until you, for some reason, have to remove an inch from the barrel, thus making it illegal is ridiculous, to say the least. The present rule makes it easy on the inspector, I agree. But the idea that two men can come before the inspector with rifles having identical barrels as to starting diameter and taper per inch and one rifle can be disqualified because the barrel was cut to 25" whereas the other is legal because it was left 26" long is hardly laughable but it is ridiculous."

After reading your letter and Mr. Freund's, let me say before I go any farther that I stick to my claim that the distance forward of the receiver for the .9" point should be given. I don't say it should be 28". If I were writing the rule I would probably make it 26" or 24". However, for the benefit of the poor mechanic who has to shape these barrels, it **should** be given in the rule.

(Continued on Page Fourteen)

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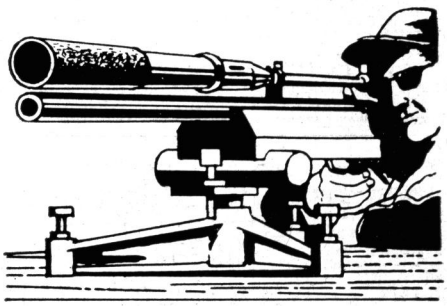

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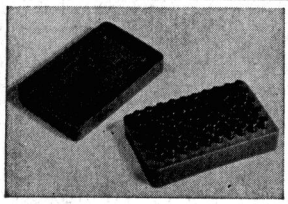

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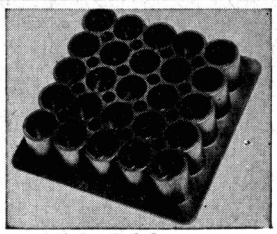

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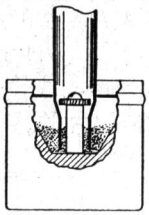

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Letters from Members

(Continued from Page Twelve)

As to the reference in your letter about the new rule bringing "baby bench rest barrels" into the Sporter, Light Varmint and Heavy Varmint classes, and Mr. Freund's remark, "This is not the kind of barrel we, in this area, want to see," I don't think you two or anyone else should lose any sleep on this point. Just did a little figuring and come up with the fact that a 20" barrel measuring 1" at the muzzle and tapering to the legal 1¼" four inches forward of the receiver would weigh just 4.0 ounces more than the same barrel tapering from .9". This additional 4 ounces would hardly put a "baby bench rest barrel" on a sporter or make the "kind of a barrel that we, in this area, would not want to see."

Fact is, in my experience in dimensioning and fitting up these barrels I have not been able to take advantage of all the weight allowed under the 1964 rule. If you leave a barrel as heavy as the "law" allows, then add the action and stock you have too little weight left for the scope and mount. Just try it. Make up a barrel by 1964 rules, 20" long by .9" at muzzle and tapering to 1¼" four inches ahead of the receiver. Select the lightest action and stock you can find, place this machinery on the scale and you will wind up using open sights, if your rifle makes the 10½-pound limit.

One other thing: The way this matter has been handled in PS by you and Mr. Freund, in which you state your case and then call for an immediate vote, doesn't look right to me. It would be the same if you heard a judge say to a jury, "The prosecutor has presented his case. You will now retire and consider your verdict. We will not bother to hear the defendant's side in the matter."

I think the defendant's side should be heard before a vote is taken. It doesn't seem at all right to present just one side and then say, "Let's have a vote." The matter is much too important to be handled in that matter."

Yours truly,
L. E. (Sam) Wilson

****

November 4, 1964
Carlson Terrace Apts.
Apt. C-202
Fayettsville, Ark.

Dear Mr. Walter:

In response to the muzzle diameter rule, I am in favor of the .900 diameter at 28", with larger diameters for shorter barrels, only because it saves recontouring a maximum size barrel when recrowning. I do not feel strongly about this matter, however. What I am greatly concerned about is this continued changing and re-changing of rules. If I build a rifle to fit this year's rules, the odds are darned good that next year my rifle will be either illegal or obsolete.

While I was at Abilene, there was a great deal of discussion concerning just what constituted a legal stock in the light classes, and whether the traditional stock definition in the grey rule book applied. It was decided at Tulsa that we did indeed want a traditional stock. Fine. But instead of using the definition already in the rule book, which seems clear and simple to me, we came up with a complicated process of measuring out the barrel 18 inches from the bolt face, placing a string on the bottom of the barrel at this point, and measuring back to the toe of the stock. All this to insure that the butt and forend are not parallel. I don't know if you have tried this test on your rifle or not, but when I try, the string strikes the forend, thus making it difficult to get a true line. This plus getting the exact distance out the barrel is going to be hard to do at a match, whereas it is quite easy to determine an acute angle at the toe.

However, Mr. Walter, I can live with this rule and the muzzle diameter rule, no matter how it comes out, **if I can be sure they will be the same in the future.** If we do not get a stable set of rules, I wonder if there will even be an NBRSA in the future. I certainly hope so. I assure you I am not ready to give up on our Association.

Sincerely,
Larry Beard

****

Nov. 4, 1964

Alfred W. Walter
1925 Raft Dr., Hanley Hills
St. Louis 33, Mo.

Dear Sir:

In regard to your article and Arthur Freund letter in the Nov. Precision Shooting. I am building a new heavy varmint rifle for the coming year, but after reading the new rule on barrel dimensions I am not very happy. I have been shooting bench rest for about three years at some meets and at a private range. The private range belongs to a good friend who feels the same as I do. We have built this range for 100 and 200 yard shooting with six covered benches and have been working hard to get more people to come out and shoot.

It appears to me that our N. B. R. S. Association is turning to follow the views of the few.

The varmint and sporter class should in my view stay with the rules we had. I know that the Association has gained new members in the varmint and sporter class because this class of rifle looks like a rifle should. The new members have been to matches where all class rifles were fired and they made the remark that they would like to get into the game with a rifle that looks like a rifle.

GAL THIRTEEN SHOOTING
AD LETTERS FROM MEMBERS

I am new to the bench rest game but not to building and shooting of rifles. And more, I spend almost every Sunday at a bench at our range shooting, working on new loads, and any way to get more people to come out and take part in our shooting sport.

We have classes that should please and give every gun bug his choice to build and do as he wants, so please let's keep it that way.

Sincerely yours,
Carl W. Johnson, Jr.
Star Route
Ellsworth, Kansas

****

R. #1, Box 329
Seminole, Okla. 74868

Dear Mr. Walter:

In regard to the change of muzzle diameter on Varmint rifles: I was surprised that it got into the rules again as stated in P. S. I wouldn't say anything about our Directors, but I gave them credit for being smarter than to let this happen again, after we had so much trouble over it last time.

I think it will for sure cause a lot of confusion and probably loss of shooters. I'm for a varmint gun being just that and not a bench gun. I think the reason for L. E. Wilson's Varmint gun being oversize on the muzzle at Abilene was because of this rule when we had it before. I do hope that we can keep it from going into effect, because even if it is in for a year, and then changed, there is a possibility of the records being broken with large muzzle guns that will be hard to beat. If possible you will hear from each and every one of us from this neck of the woods and hope it does some good.

Respectfully,
Jack Morgan
Jean Morgan

Nov. 2, 1964

Alfred W. Walter, President
N. B. R. S. A.
Dear Sir;

I am writing in response to your letter (p. 10, November, Precision Shooting.) I am a new individual member of the N. B. R. S. A., however, I have enjoyed Precision Shooting for a number of years, and have participated in a few matches for several years, as secretary of Pioneer Gun Club, Inc. When I resigned as secretary, I joined as an individual because I like shooting and shooters. As some kind of an introduction (since I haven't had the pleasure of meeting you in person) I would like to say that I have been fooling around with guns most all of my life. I even ran a part-time gun repair shop for 5 years (until I ran out of patience . . . with the people, not the guns.) I shot muzzle-loaders, pistol, small-bore, and even managed to win a berth on the state rifle team (Missouri Hi-Power) once. I tossed pistol and trap over the side because of the "shoot for money" angle. I know a lot of nice guys who shoot pistol; I know more nice guys who shoot smallbore; and there is 8 years of swell fellows, good sportsmen, with whom I've had a wonderful time with on the long ranges at Ft. Riley, Ft. Leonard Wood, Camp Perry and many other places, but . . . man for man, some of the nicest guys you can meet, are sitting at a bench behind a weird looking rifle. The gun can be anything; a factory 40-X, a Sako .222, a Gillman Tomcat, a 220 P. S., a sleeved action job or even Bob Stultz's what-ever-you-call-it. These guys are friendly, interested and helpful. This is the kind of nut that I want to be around.

I didn't mean to ramble, but as President of this gang, you ought to know what kind of riff-raff you are heading.

I read page 10 and page 11 of this month's P. S. and would prefer to get my headaches from wondering why my .222 barrel is fouling, but this is important.

I picked varmint class shooting for a couple of reasons. One, I can shoot the same gun at varmints. Two, it appeals to me, as an occasional match competitor, not as a full time bench-rester. I have, in front of me, a 1951 article by Bob Hutton on bench rest shooting . . . the pictures accompanying the article look surprisingly like my varmint rifle, except somebody named Sam Clark has a new bedding device. The point is, in my opinion, that bench rest guns evolved from plain old varmint rifles to Clarks Bedding Device, to rails and rear stands, to unrecognizable (as rifles) machines. Well, I'm glad to say that someone recognized the plight of us crow killers and devised something for the common man . . . Varmint Class shooting. It has really been growing, or has it? It seems that somebody is dipping in our corn-crib, first all power restrictions have been removed, now my stock isn't the right shape, and gee whiz, you mean I can use the same barrel as the big boys? Oh, to hell with it, I'll just shoot unrestricted bench rest, if I can scrape up the money after the kids new shoes and tonsilectomy. Or, maybe I'll just go back to killing crows, and forget about these guys, they won't be so nice after they find out that their new 6mm International isn't legal now.

Mr. Walter, I've invited several former bench shooters to go to varmint class matches wtih me; unsuccessfully, because of this sort of nonsense.

If I may recommend something simple, it would be to go back to the simple rules. Maximum stock width, maximum barrel diameter (.900 at 26 inches), 15X scope limit, sandbags, 10½# & 13½# weight limits, etc. A good rule (stolen from the Boy Scouts) is: Keep it simple, make it fun. Seeing as how the only difference between men and boys is the cost of their toys, maybe we can benefit from the Scout rule. It figures that only a percentage of shooters will shoot the heavy stuff, and of course, it then looks like we will get more unlimited shooters if we get more varmint shooters. Some of them will undoubtedly convert, if they once get started in some type of Stool Shooting.

I say forget Remington. I appreciate the fact that they came up with the 40-X for varmint class shooters, but race horses are bred for racing . . . not racing designed for a particular horse. If you fool around making classes for everybody, why not make one for my gun alone, maybe I could win that one (I'll send you the serial number and we can call it the—serial number class.) Let's take care of the gunsmith who is making a living (?) trying to please his shooters, he asks the customers what is desired and tries to please him. I see very few gunsmiths making some weird gun and then trying to change the rules to fit.

I think Varmint Class and Sporter Class shooting is the drawing card to this type of shooting, and if it gets too complicated we will lose more shooters than we can possibly gain. Not knocking the directors, but maybe they should look down under the clouds that surround some heads, and see that a lot of our **members** don't enter matches. Maybe poor attendance is due to confusion. The Tyro Match staged by Millcreek Gun Club looked like a good idea to me (I understand that was dreamed up by a couple of directors, so at least some of them have their eyes open.)

What I said back on the last part of page 1 still goes, this is a swell bunch of fellows.

Sincerely,
Jim Coonce
7716 Englewood
Raytown, Mo.

SCALE PAN CONVERSION

The Lyman Gun Sight Corporation advises that: "Owners of Lyman-Ohaus Model 505 Handloading Scales may now have these scales converted to use the improved type pan and hanger assembly now supplied with the Lyman-Ohaus Model D-5 Scale. To convert these scales, original pans and pan hangers should be sent to the Lyman Gun Sight Corporation, Attention: Scale Department, Middlefield, Connecticut. Cost of Conversion is $2.50 postpaid."

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P. H. T.

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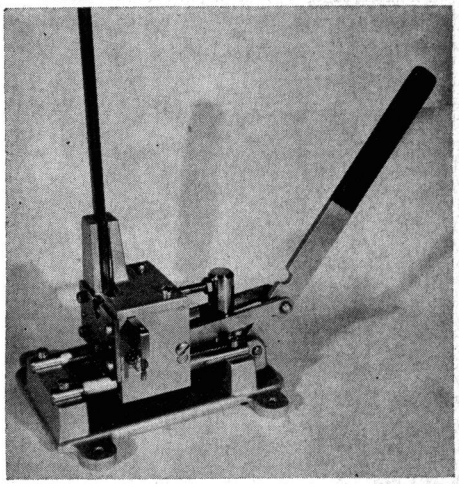

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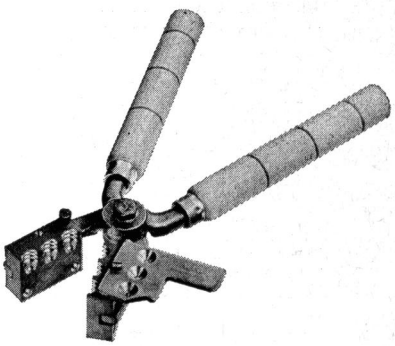

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BARREL INSULATION FOR SUN AND WIND

By Jesse M. Grigg

When the ordinary temperature of ferrous metal is changed in a body whose surfaces are free to move, the external dimensions of the body are changed. If such deformation is resisted by yielding constriction, the metal does an amount of work equal to that which would be needed to cause the same deformation by external forces without addition or subtraction of heat. Thus resistance to deformation is always accompanied by internal stress when temperature is changed. For this reason slack is left in telegraph wires that are strung in summer, and between railroad rails laid in cold weather gaps are left to avoid kinking in the hot season. These and other examples which might be cited in proof of internal stress are also proof that dimensions change with temperature change.

If the temperature change is not equal in all parts of the body, the latter suffers a distortion which ordinarily disappears when the temperature becomes constant throughout. Further, if the temperature throughout is returned to its original value, the original form and dimensions are resumed, an exception of course being the sudden cooling of steel at hardening temperature. If the body undergoing moderate temperature change happens to be a piece that is long and slender, as is a rifle barrel, and temperatures on diametrically opposite sides are unequal, the dimension change is in the form of temporary curvature. This is necessarily so because the lengths on opposite sides are unequal, and their radii of curvature therefor are unequal. For the rifle barrel it might be shown that the resulting mean radius of curvature is proportional directly to the product of barrel length and temperature difference between sides, and inversely proportional to the diameter. Thus, in unequal heating, a short, thick barrel is bent less than is a long, slender one.

In a bar or rod the linear change with temperature is less than one might suppose. In fact the change of length due to a uniform 10° change of temperature in a steel bar 30 inches long is only about .00195", which is not much. But if the section is square, measures one inch on a side, and the gradient of the temperature difference uniformly varies from surrounding air temperature on one side to 10° greater or less than this on the opposite side, there will then be in the bar a curvature which subtends an angle of nearly 7 minutes between radii at the ends. The deviation of the tangents, if the curve were prolonged as in a trajectory, would amount to nearly 7 inches at 100 yards.

The calculation is not simple, for unequal temperatures in a rod of circular section with a hole through it. Nevertheless, judging by the magnitude of bend in a bar of square section, it is obvious that the effect of unequal temperatures on diametrically opposite sides of a rifle barrel is disastrous to the point of bullet impact.

Many years ago I demonstrated by experiment the fact of such curving. A light 24" .22 caliber barrel was clamped in a vise with the sights aligned on a mark. The front sight moved off an estimated minute of angle when the flame of a blow torch was passed along one side a couple of times. After an interval of cooling, similarly short, the front sight returned to the mark. Recently I saw a shooter friend of mine demonstrate the same principle by laying a match barrel in V-blocks and holding a burning cigarette lighter under the middle. An adjacent section of the barrel was deflected an amount which was measurable with a dial gauge.

In all this is apparent that curving takes place only if temperatures on opposite sides of the barrel become uneven. This is a condition which is likely to occur when the barrel is exposed to direct sunshine for an appreciable time. In this event there are two sources of heating. One is internal combustion which imparts heat uniformly around the bore at any given barrel section; the other is sun heat imparted on the side where the sun shines.

But heat gain and heat loss are processes which take place simultaneously. At the same time that heat is being absorbed some of it is being dissipated in radiation. In a continued process, temperature increases until the rate of radiation just equals the rate of absorption. In the barrel, however, constancy in the relation between absorption and radiation is not likely to be attained. The radiation rate, like that of heat absorption in sunlight, is not uniform over the whole barrel surface. Less of cooling occurs inside the stock groove than occurs outside where the surfaces are exposed. Worse, wind blowing on the exposed surfaces rapidly extracts heat, but does so on the side which faces the wind. Moreover, as is well known, winds vary in both strength and direction. Thus as the sun imparts heat on its side, while wind extracts heat on the side to which it blows, and further, radiation in the stock groove is less than radiation outside, it is inevitable that irregular deformation will occur. Even in the absence of sunshine this is possible if wind is present and firing itself heats the barrel above the prevailing temperature of the surrounding air.

In my experience a barrel that is hot to the touch between the receiver and the end of the forestock is one which is susceptible to heat trouble. The breakdown may come very suddenly, and be manifested by a total failure of the rifle to group, a condition which endures until the rifle has been allowed to cool in shade. As little as five minutes in shade may sometimes restore it to temporary accuracy.

An obvious remedy is to avoid firing in direct sunlight, but this is not generally practicable. Not all firing lines are artificially shaded, and umbrellas are not universally permitted. The next simplest procedure is covering the barrel with a light-reflecting substance, such as aluminum paint, an idea that was introduced in my area by Harry R. Tevis and Edw. J. Roth after laboratory tests. The same purpose is served incidentally and even better in use of the bright, stainless steel barrels which are now a familiar sight on smallbore firing lines. To utilize the principle, one shooter I know went so far as to polish all the blue off the barrel of an almost new rifle, and is still glad that he did.

Though the light-reflecting barrel is a vast improvement, and does not become hot to the touch, nevertheless it does become warm after long exposure. Being warmer than the surrounding air, it is thus susceptible to wind cooling, for which reason it may become erratic at times.

Having finally concluded that this was so, I set myself the task of trying to devise a remedy for the wind condition, too. Result was the notion that a combination of light-reflection plus heat-insulation would solve both problems. As to method, enclosing the barrel in a stock of the military type was considered, then quickly rejected in belief that the bulk in a .22 match rifle would be pushed around too much by wind. In the end I adopted an asbestos covering sheathed in aluminum foil, a combination that reflects sun's rays and at the same time insulates against sudden temperature change.

To be concluded in

January 1965

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BULL-SESSION STUFF

(Continued from Page Three)

and not feel foolish, after they reach four score.

Cannot match you with the rifle, as I only made sharpshooter this year, due to the fact that I have a cataract in the right eye and have to shoot left-handed, which feels clumsy and unnatural. However I am still making Expert with the pistol without any trouble, as I have done for thirty years (Was top pistol shot in my National Guard artillery regiment in 1908, long before I heard of the N. R. A.).

Had two articles in the November issue of P. S., one of which may give some idea of my present ability with the handgun. Not too good, but not too bad either.

My hearty congratulations to you. I figure that anyone who can stay with the game up to 81 has nothing basic the matter with him, and probably expects to be right there ten years later. I do.

William E. Peterson
4 Orchard Lane
New Canaan, Conn.

FROM ENGLAND
(Excerpts from a letter)

Of particular interest as far as I am concerned are the articles on long range rifle shooting and bedding. However, the ballistic co-efficient of the bullet seems to be more or less ignored.

For instance, I have found that I can get about ¾ inch groups at about 100 yards with the Norma 187 grain boat tail and about 1 inch groups with Western Super Match bullets. But at 1000 yards the Norma bullet requires about 20% more wind allowance which is certainly a small price to pay for a slight vertical opening of the group.

I tried bedding the recoil lug and the barrel of my 7.62 match rifle about 12 inches forward with fibre glass, tying the barrel down with a hose clamp. The receiver was completely freed from contact and the rear tang screw was left off. Results were quite discouraging. Could you give me the address of someone with whom I could discuss this method of bedding. and also the sleeve method. (Can any of you help on this?—Ed.)

I hope to see some more articles by Creighton Audette, especially on his recoil lug loading, as mentioned in one of your previous issues.

G. W. P. Swenson
27 Quarry Hill Road
TONBRIDGE, Kent,
England

BULLET MAKING DIES

Dear Vic:

I am most pleased to have your letter about dies as I am finishing up an article for Phil (long overdue because I have neglected my housework all summer to shoot and have had to catch up on it) on a low cost, easily built electric furnace which is necessary to die building and which, if Phil is agreeable, will be a preamble to a series on die and bullet making. I am glad to find there is interest in this area.

I'm far from the best die maker in the bench rest group but those who are tops are just not writers. As to divulging secrets, I have not found any bench rester who was unwilling to give me any information I needed, in fact they have been most generous and anxious to help and I am most happy to try to help you. I'm sympathetic to your position because, so far removed from anyone to sharpen my wits in bull sessions, I spent many hours and made many mistakes before I got a set of dies I considered satisfactory. The questions you asked are almost the same as those that puzzled me. The whole story will take several thousand words, pictures

(Continued on Page Eighteen)

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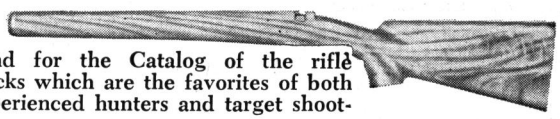

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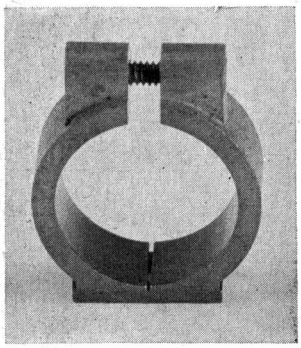

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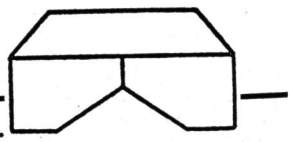

BULL-SESSION STUFF

(Continued from Page Seventeen)

and drawings, so I will just answer the questions you pose and suggest you write as soon as you encounter new problems.

DESIGN: I deliberately copied B & A, down to the die body and thread dimensions, not because I wanted to but to be able to make parts for my friends. Tooling up is a major part of the job and if I adopted a different design it would be too time consuming to make a B & A replacement. I would prefer a design with the swage in the ram as more convenient to operate.

STEELS: I use cold rolled for the die bodies and see no need for heat treatment, thus avoiding warping. I have used Allegaheny-Ludlum Deward for punches as it works well, is low deforming in heat treatment, hardens at a low temperature and seems to wear well. However, I do plan to try some tungsten which has higher abrasion resistance, particularly for the core forming dies where a real tight fit is needed to avoid "whiskers."

I use Allegaheny-Ludlum Oilgraph for the inserts for no particular reason other than it is shown in the catalogue as being designed for wire drawing dies. It works easily and reams smoother than other steels I have used. It is oil hardening but I quench in water (about 100° F) to get as hard as possible. I have also rigged up a tire pump to squirt water into the interior to get the last possible degree of hardness. No trouble with cracking or brittleness.

REAMERS: I make reamers of Deward because of its non-deforming properties. If I were going into quantity production I would use a tougher tungsten steel. I make them all fluted as they cut smoother—there is nothing so boring as lapping-out deep scratches. I put a pilot drill on the bullet swage reamer to insure the exact centering of the knock out pin.

DIMENSIONS: I have found, and B & A agree, that about .003" in diameter must be allowed for reamer scratches. EU puzzles me. Where do you measure? Good bullets can taper as much as .0005" in the cylindrical section. I make the core seater .0002" smaller than the finished bullet (as measured just forward of the pressure ring at the base) and it seems to work out OK.

The thread business is a long story. With a nice tight fit the insert will stay in line with the body up to the point of final tightening, which will throw it considerably out of line. B & A take care of this by making the punch hole oversize. I am going to a design which does not have threads.

I am using a 7S Ogive for .22 and 6mm and will probably go to 8S or 9S for some .30 cal. dies I am building. Lapping and polishing are almost a book in themselves. Most important is to be sure that the ogive and point are well lapped out to keep the point concentric. I start with 240 mesh diamond compound on a cold rolled steel lap and wind up with 0-3 mecron diamond. A final polish with a cotton swab coated with jewelers rouge, hand held in a high speed hand grinder, does wonders and takes off no measurable material.

Good luck and happy tinkering—

Cordially,

W. J. Purcell
Howes Cave, N. Y.

TRADIN' POST

Classified type ads; no display. **Rates:** — 10¢ per word per insertion, prepaid. Minimum charge $1.00. Closing date for ads is the last Saturday of the month preceding publication.

Groups of figures, abbreviations and initials count as words. Hyphenated word counts as two words. Name and address of advertiser is counted. Use full words instead of initials and abbreviations and make your meaning entirely clear — get your money's worth.

WANTED: Shooters News before 1953. Vic Fogle, 527 E Street, Springfield, Oregon.

TOURNAMENT CIRCUIT

MAINE PISTOL TOURNAMENT

Twenty-two competed in the 4th Thomaston 1800 Outdoor Pistol Tournament on the Maine State Prison range at Thomaston, Sunday, October 4th. The score bulletin notes, "a state-wide alert hampered the attendance after the registration was sold out."

Lt. Col. Albert Panko, Loring AFB, won the 1800 point grand aggregate with a 1693-41x score. Bob Baxter, Bath, Me., was runner-up with 1669-49x, and Carmichael, Topsham Air Station, was 1st Expert and 3rd high overall with 1620-28x.

Baxter was top scorer in the .22 cal. matches with an 867-30x over Panko's 863-23x, and Carmichael was 3rd overall with 846-17x.

Panko turned the tables in the Center Fire matches and his 830-18x aggregate smothered Baxter's 802-19x.

Match awards were all hand-made by prison inmates; the winner's award being a model of the old sailing vessel "Atlantic" in a glass case.

JAMESTOWN, NEW YORK

Twenty-five senior shooters (16 in Master class) and five juniors participated in the Fall Smallbore Tournament conducted by the Jamsetown Rifle Club on October 18th. High four-match aggregate scorers were:

Earl Peebles	1598-113x
Loren Samsel	1597-123x
George Handel	1597-122x
Henry Genthner	1596-112x
C. H. Kline	1594-118x
Expert Class	
Carl Freeman	1593-111x
Robert Smith	1592-103x
High Junior	
Barry Brucklacher	1551-54x

Peebles won the 50 yd. iron with 400-34 (over Samsel's 400-30 and Allen Holden's 400-29) and the Dewar Match with 400-28x (to beat Orville Domras' 400-25 and Handel's 399-32).

Samsel won the 50 yd. any sight with 400-39x, over Handel's 400-37 and Kline's 400-36 (and Ray Wilson's 400-36). Expert class Fred Parker fired top score in the 100 yd. any sight match—399-30x—while top Master scorers were Henry Genthner 399-27x, Samsel 399-26x and Handel 398-26x.

NEW DU PONT HANDBOOK

The Du Pont Explosives Department has just prepared a new handloading data booklet, titled "The Handloader's Guide to Powders," which supplies information for rifle and pistol cartridge and shotshell handloaders.

The rifle and pistol data includes listing of ALL Du Pont powders which may be used with a particular cartridge, the powder charge (apparently the recommended maximum charge), muzzle velocity and chamber pressure. There are separate listings for each weight bullet commonly available for a particular cartridge. In this writer's opinion, this data is very worthwhile because it includes powders and charges suitable for reduced and moderate loads for the larger capacity rifle cartridges.

The shotshell data includes DuPont powders suitable for the gauge and cartridge, in most cases lists several charges for some of the powder types, gives information on recommended wad column and wad pressure, shot charges, muzzle velocity and chamber pressure.

This "GUIDE" is, we believe, something that **every** handloader should have at hand for ready reference. It doesn't take the place of the standard complete Handloading Manuals, but it sure is a worthwhile addition to the information contained in the manuals.

Copies of THE HANDLOADER'S GUIDE TO POWDERS may be obtained by writing to Explosives Department, Du Pont Company, Wilmington, Delaware 19898.

P. H. T.

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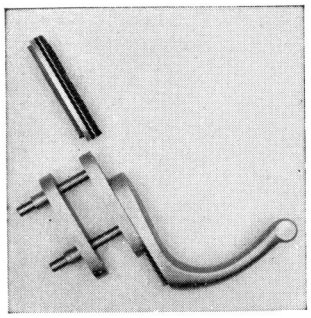
It Is Supreme — It Is Accurate

MARK III Less sights $210.00
MARK III with 1-8 Min Parker-Hale sights $245.00
MARK III with Freeland sights $280.00

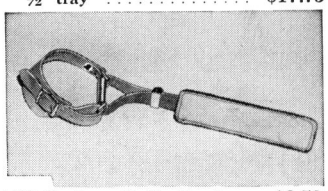


Freeland "61" International Butt Plate $33.00

Swiss Type Palm Rest

Freeland 30 Caliber Kit .. $13.50
48¾" Rifle Trunk $26.25
¼ Opening small bore kit .. $20.00
Freeland 31" Accessory Kit, ½ tray $17.75

All Angle Tripod



Mid-Century Cuff, Comb. .. $8.50

FREELAND Olympic All Aluminum Butt Plate $10.50
FREELAND Base Plate with Free Rifle Hook, Oly. $16.50
FREELAND Butt Plate with Rubber Pad, Olympic $13.00
FREELAND Free Rifle Hook Only, Olympic $9.25
Butt Plate Spacer ½" or ¾" $7.00

REGAL BIPOD, mention scope $23.50
FREELAND DEWAR CART. BLOCK $2.55
Foam padded Freeland glove $5.25
BSA MARK III OLY. PALM REST $17.50
Freeland SWISS TYPE PALM REST $20.50
FREELAND PALM REST, ball type $15.50
52D—OLY. PALM REST $16.50
FREELAND ALL ANGLE TRIPOD, in green, gray or black, mention scope $15.25
Bipod GALLERY SPEC. SCOPE STAND $18.90
FREELAND BIPOD, mention scope $17.50
FREELAND Carwindow attachment $7.50
Freeland Superior Front Sight $15.00
FREELAND TUBE rear sight $42.50
Freeland Fore End Stops 52M, 52T, 75, 513, 40X and 521T $3.00
"AR" SHOOTING MAT $27.00
FREELAND 52-D FORE-END STOP $4.00
Freeland Sling Keeper $1.25
Kneeling Pad $5.25
Freeland Pistol Box Adapter $5.25
ZOOM TRIPOD $16.25
ZLC ZOOM scope leather case $6.25
Freeland Recoil Spring $3.50
ZIPPER CASE, for most scopes $5.25
DeLuxe Cuff & Hook $4.25

61-S Olympic 1¼" cuff-sling $6.00
Freeland tapered cuff combination #61A .. $6.75
Freeland AF55L Exceptional Leather RIFLE CASE $35.00
10-X Rifle Coat $22.00

A FEW GUNS

MOSSBERG 144LS .22 Repeater $58.45
ANSCHUTZ 1413 M54 Rifle, R. H. $275.00
REMINGTON 1100 Plain Bbl. $149.95
REMINGTON 521T Target Rifle $59.95
REMINGTON 40X H2 or S2 ..... $154.95
WINCHESTER M70 Featherweight $139.95
Win. 52-D Std. or Heavy Wt. $145.00
WINCHESTER M70 Target $190.00
SHERIDAN Blue or Silver Streak $27.50
BROWNING AUTO—5 Standard $154.75
SAVAGE 99DL HP Rifle $139.50
S&W K-22, K-32 or K-38 ..... $81.00
STURM RUGER Mark I Target $57.50
STURM RUGER SINGLE SIX $64.25
HIGH STANDARD DERRINGER 9163 .. $29.95

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